



The Future of California Transportation Revenue

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EXECUTIVE SUMMARY

A stable, predictable, and adequate stream of revenues is critical to the State of California's ability to plan and deliver an excellent transportation system. This report projects through 2040 the amount of transportation revenue that the state's own taxes will raise to support transportation services and infrastructure. We consider likely revenue streams under two scenarios: (i) projected revenues under current state laws, which include provisions adopted in the 2017 Senate Bill 1 (SB1); and (ii) projected revenues should SB1 be repealed by voters in a November 2018 referendum, Proposition 6, on the state ballot. The report also assesses likely public support for transportation tax and fee policy, since any policy changes will be informed by (i) public sentiment about which taxes or fees would be most appropriate and (ii) general willingness to consider revenue increases.

California Senate Bill 1 (SB1), the Road Repair and Accountability Act, modified the mechanisms the state uses to raise transportation revenue. SB1 was enacted into law in April 2017, with implementation beginning in November of that year. The act increases several state taxes and fees, with starting dates for the increases staggered between November 2017 and July 2020, as shown in Table ES1. SB1 increased excise taxes on gasoline and diesel fuel; replaced a state sales tax on fuel with an additional excise tax indexed to inflation; added to the cost of annual vehicle registration a new "Transportation Improvement Fee" that ranges from \$25 to \$175 depending on the vehicle value; and added a new \$100 annual fee for electric vehicles. The law also provides for inflationary adjustments (i.e., indexing fuel taxes to change based on the California Consumer Price Index) so that the purchasing power of fuel tax revenues does not diminish because of inflation, as it has in the past.

Table ES1: State of California Transportation Tax and Fee Rates, Before and After Senate Bill 1 (SB1)

	Rates ^a		SB1 Date Effective
	Before SB1	After SB1 ^b	
Gasoline taxes			
Base excise (per gallon)	18¢	30¢	11/1/2017
Swap excise (per gallon)	9.8¢	17.3¢	7/1/2019
Diesel taxes			
Excise (per gallon)	16¢	36¢	11/1/2017
Swap sales	1.75%	5.75%	11/1/2017
Vehicle fees ^c			
Transportation Improvement Fee	--	\$25–\$175	1/1/2018
Zero-Emission Vehicle (ZEV) registration fee	--	\$100	7/1/2020

Source: Adapted from California Legislative Analyst's Office, Overview of 2017 Transportation Funding Package (2017), <http://www.lao.ca.gov/Publications/Report/3688> (accessed July 25, 2018).

^a For details about the gas tax swap, including tax and fee rates prior to the swap, see Anne Brown, Mark Garrett, and Martin Wachs, "Assessing the California Fuel Tax Swap of 2010," Transportation Research Record: The Journal of the Transportation Research Board, no. 2670 (2017), pp. 16–23.

^b Adjusted for inflation starting July 1, 2020 for the gasoline and diesel excise taxes, January 1, 2020 for the Transportation Improvement Fee, and January 1, 2021 for the ZEV registration fee. The diesel sales taxes are not adjusted for inflation.

^c Revenues from the state's current vehicle registration fee and vehicle license fee are not spent on transportation programs so are not considered in the table.

SB1 decisively influences future transportation revenues available in California. Transportation funding in California is currently estimated to total \$35 billion per year, with about a third coming from state sources (\$12 billion). Therefore, the decision about whether to keep or repeal SB1 not only has a huge influence on state-generated revenues, but will also profoundly impact the transportation revenues available from all levels of government combined. Many localities match state funds with local contributions, giving state revenues even greater influence than their dollar values might suggest. Los Angeles County's Metropolitan Transportation Authority, for example, complements its local sales tax revenue with state funds as it expands the region's transit system.

This report consists of three sections. The first reviews the history of transportation finance in California in order to provide background for the enactment of SB1 taxes and fees. The second section forecasts the state-generated transportation revenues that will be generated through 2040, showing expected revenues both with SB1 in place and without it. Finally, because additional revenues will likely be needed in the future to maintain the state's transportation programs, with or without SB1 in place, the final section reviews what is known about public attitudes toward different options for generating transportation revenues.

HOW WE GOT HERE: RAISING TRANSPORTATION REVENUE IN CALIFORNIA

To place the recent legislation into its policy context, we present a short overview of the history and context of California transportation revenue collection.

In recent years, most revenue needed to support highway and transit programs has come from three major sources—user fees, general revenues, and local-option sales taxes (LOSTs). User fees in the form of state and federal excise taxes on gasoline and diesel motor fuel have produced the lion's share of state transportation revenue for capital improvements, operations, and maintenance during most of the twentieth century. In the last two decades, however, inflation-adjusted revenue per capita and per vehicle-mile-traveled (VMT) from state and federal fuel taxes has dropped markedly. The causes for this decline include the fact that neither the state nor federal government raised the cents-per-gallon fuel tax rates for decades, and vehicle fuel efficiency standards have lowered user fee payments per mile driven. Finally, throughout the last 100 years, general fund revenues, particularly state and local municipal bonds, have provided for some transportation capital improvements and supported local street improvements and maintenance.¹

PROJECTED STATE TRANSPORTATION REVENUES WITH AND WITHOUT SB1

Figure ES1 summarizes our projections for annual total state-generated revenues for transportation through 2040, under two scenarios—with and without SB1 in place. The outcome for each scenario combines revenues from all taxes or fees that would be in place: taxes on gasoline and diesel and, under SB1, the annual Transportation Improvement Fee and Zero-Emission Vehicle (ZEV) registration fee. We present the projections in constant 2017 dollars.

The figure shows the projections as colored bands, with the upper band showing revenue with SB1 in place, and the lower band showing projections should SB1 be repealed. We represent the projections as bands rather than as lines to acknowledge that future revenues depend on a great many factors that cannot be precisely predicted, from inflation rates to changes in the value of vehicles on the road to ZEV adoption rates. The bands represent predicted future revenue under a wide range of plausible scenarios—e.g., different inflation rates—while the dashed line at the center of each band represents the mean projection. Readers should note that it is, of course, possible that major policy or socio-economic changes in California could cause revenues to fall outside the bands. For example, in 2012 Governor Brown committed the state to putting 1.5 million clean cars on the road by 2025—and in 2018 he raised that goal to 5 million by 2030. Automakers have sold about 380,000 zero-emission vehicles in California since 2011, however, and the projections in this report reflect trends in sales rather than stated goals. Should California meet its recently adopted goal before our projection horizon year of 2040, then fuel tax revenue flows would be quite different.

Unsurprisingly, state-generated transportation revenues will be higher under SB1 than if the act is repealed. For 2020, the mean projection is that the state will collect \$10.4 billion with SB1 in place and \$6.6 billion without it, a difference of \$3.8 billion. Over time, changes in fuel economy and other factors will change annual revenue. By 2040, the mean projection is that the state will collect \$8.6 billion with SB1 and \$3.4 billion without it, a \$5.2 billion difference. If one sums up all state transportation revenue collected between 2018 and 2040, and if we assume that there are no other revisions to transportation revenue programs, the total under a SB1 repeal will be about \$100 billion less than if the law is retained.

Looking at the trend from 2018 to 2040, revenues rise through 2020 under SB1 and then slowly decline, whereas if SB1 is repealed, revenues drop steadily from 2018. The revenue declines shown under both scenarios occur in large part because gasoline taxes will raise less revenue as fuel efficiency improves and electric vehicles become a larger share of the vehicle stock in California.

In addition to projecting revenues to be collected statewide, we examined the impact on individual Californians. Figure ES2 compares the annual revenue that will be collected *per registered vehicle* should SB1 be retained or repealed. With SB1, the mean predicted revenues collected per registered vehicle will increase from around \$265 in 2018 to a maximum of \$310 by 2020. Revenues per vehicle will decline after 2020, dropping to approximately \$190 per vehicle in 2040. Should SB1 be repealed, mean predicted revenues collected per vehicle will drop every year, falling to about \$74 in 2040.

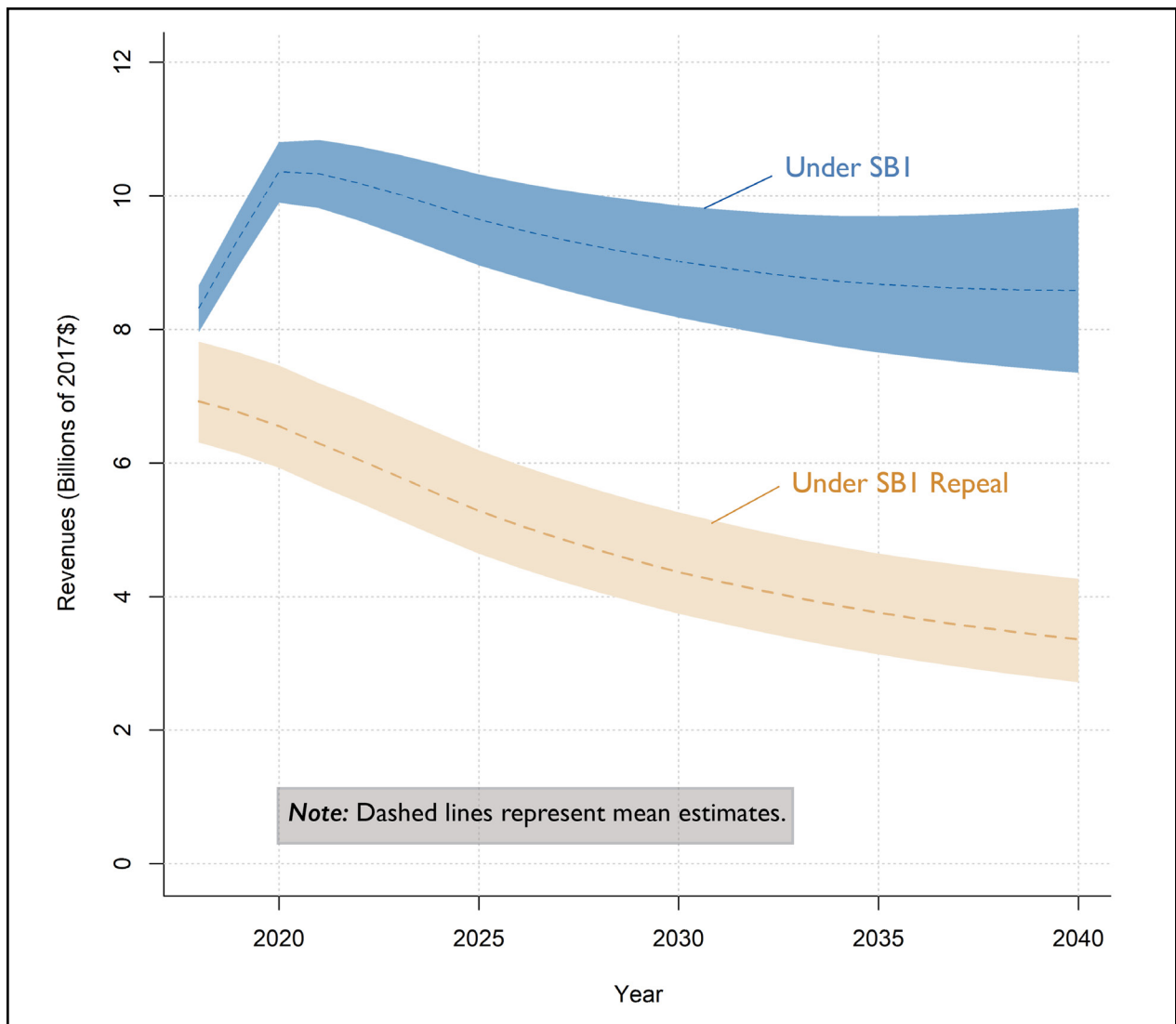


Figure ES1: Projected Total Transportation Revenue Collected Under SB1 and its Repeal, 2018–2040

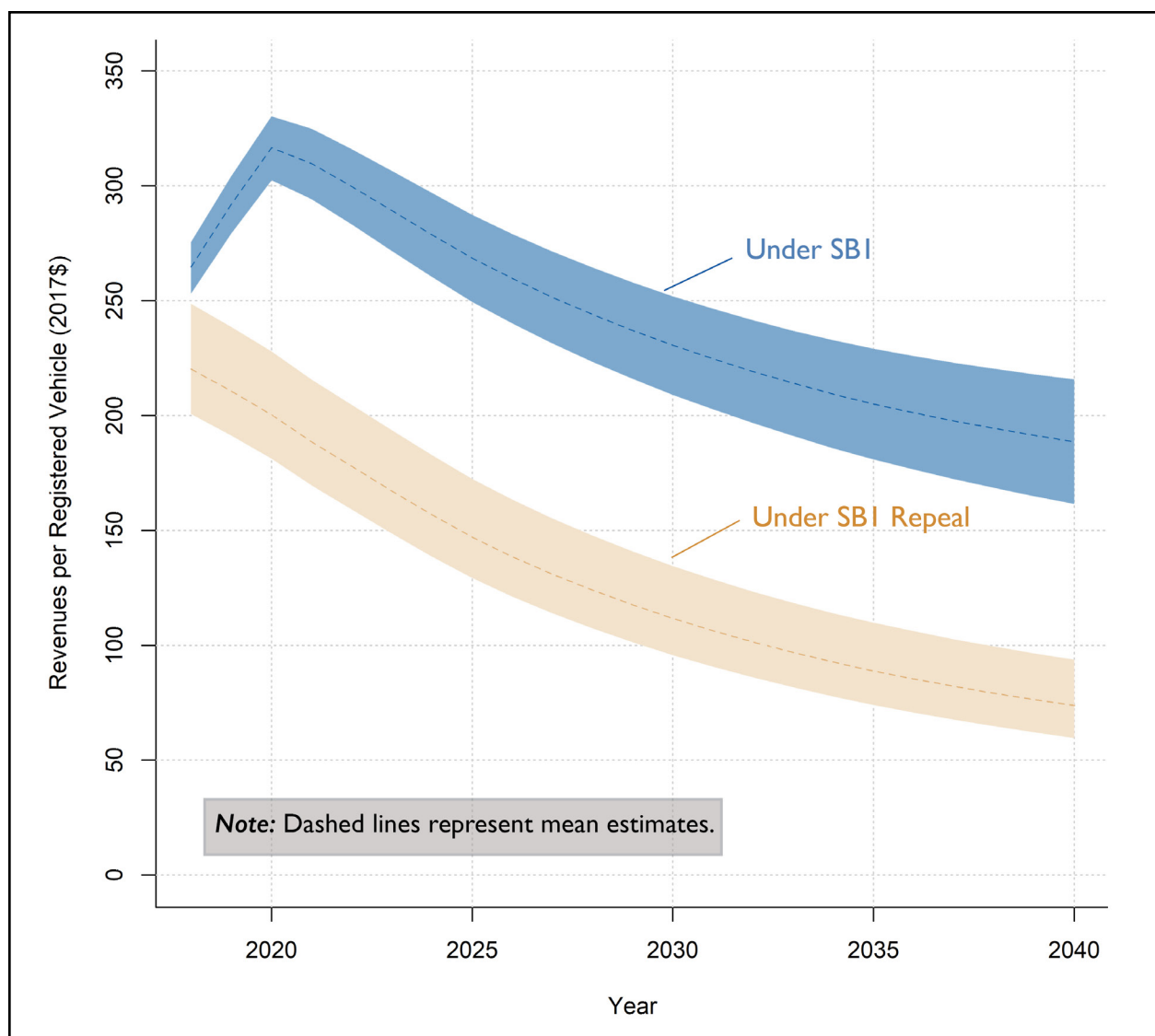


Figure ES2: Annual Transportation Revenue Collected per Registered Vehicle Under SB1 and its Repeal, 2018–2040

PUBLIC OPINION ABOUT STATE TRANSPORTATION REVENUE OPTIONS

The final section of the report examines what is known about public attitudes toward raising transportation revenues, since the state will likely change its taxes and fees in the future, with or without SB1. This will be necessary because inflation, improved vehicle fuel economy, and a rising proportion of vehicles powered by electricity will all reduce the flow of revenue over time.

A review of public opinion research and voting records reveals that public opinion about transportation revenue options varies according to the characteristics of a proposed new transportation tax or fee increase; taxes are not all equal in the eyes of the electorate. While some taxes are without question unpopular, others have earned majority or even supermajority support both on the ballot and in public opinion research.

Evidence that tax type influences public opinion suggests a variety of ways in which California policymakers can craft transportation tax and fee proposals that reflect public priorities. Support levels will likely be higher when Californians believe revenue collected is being spent efficiently and on things they care about, such as maintenance of existing systems and services, safety improvements, and programs that benefit the environment. People also generally favor measures that are similar to the gasoline tax in several respects: measures that are simple to understand and easy to pay; have low apparent out-of-pocket costs; and are paid “automatically” in small amounts rather than through periodic lump-sum payments that require an account and billing.

CONCLUSION

California will have significantly more resources for its transportation programs over the coming decades with SB1 than without it. By 2040, we expect \$5.2 billion per year more if SB1 is kept in place than if it is repealed.

I. INTRODUCTION

A stable, predictable, and adequate stream of revenue is critical to the State of California's ability to plan and deliver an excellent transportation system. This report forecasts how much transportation revenue will be raised through the state's own taxes and fees from the present through 2040. Central to this exercise is considering likely revenue streams under two scenarios: projected revenues under current state laws, which include provisions adopted in the 2017 Senate Bill 1 (SB1), and projected revenues should SB1 be repealed by voters in a November 2018 referendum on the state ballot. The report also assesses likely public support for transportation tax and fee policy, since any policy changes will be informed by public sentiment about which taxes or fees would be most appropriate and general willingness to consider revenue increases.

Transportation funding in California currently is estimated to total \$35 billion per year. Of this amount, \$16 billion comes from local sources, \$12 billion from state sources, and \$7 billion from federal sources. Local funding mainly comes from sales taxes, transit fares, and city and county general funds, while federal funding mainly comes from federal fuel taxes. State funding mainly comes from state fuel and vehicle taxes, which were increased by SB1 and would be affected directly by Proposition 6.² While the proposition impacts state funding directly, to the extent that local governments might replace funds otherwise obtained from the state, they would also be impacted.³

SB1, formally titled the Road Repair and Accountability Act of 2017, provided a package of measures to raise new transportation revenues through 2040 in the interest of maintaining and upgrading California's transportation system. The revenue measures included changes to existing taxes on gasoline and diesel fuels and vehicle registration fees.

State legislators and Governor Jerry Brown supported the bill in the face of a decades-long state transportation funding crisis that left California's roads badly in need of costly repair and replacement. A total of 68% of the state's roads are in "poor" or "mediocre" condition—the second worst percentage in the nation—and nearly one-quarter of California's bridges are structurally deficient.⁴ Indeed, the California Department of Transportation (Caltrans) assessed the average condition of road pavements as so poor that, without immediate preventative maintenance, many "at risk" facilities would degrade quickly enough to dramatically increase rehabilitation and reconstruction costs.⁵ During early 2017 when SB1 was crafted and debated, the state projected annual transportation revenues of only \$23 billion, compared to need for \$57 billion annually to correct serious and substantial existing deficiencies in the state's core highway infrastructure. It was also projected that California needed another \$78 billion annually to fix local streets and roads.⁶

Faced with such enormous challenges, in 2017 the state finally took action after decades of debate and failed prior attempts. SB1 became law in April 2017, and its provisions went into effect November of that year. SB1 was planned so that it would raise over \$5 billion annually in new transportation revenues once fully implemented.

Table 1 summarizes the major features of SB1, namely changes to gasoline rates, diesel tax rates, and vehicle registration fees. The law also provides for inflationary adjustments (indexing annually according the California Consumer Price Index) so that the purchasing power of fuel tax revenue does not decline because of inflation as it has in the past. To lessen negative public reactions and ease the transition, the new taxes and fees have starting dates that are staggered between November 2017 and July 2020. Specifically, SB1 increased excise taxes on gasoline by 12 cents per gallon and on diesel fuel by 20 cents per gallon, starting on November 1, 2017. It will replace the sales tax on fuel that resulted from the “gas tax swap” of 2010 starting in July 2019 by an additional excise tax indexed to inflation. In addition, the bill adds a new “Transportation Improvement Fee” of \$25 to \$175 to the cost of annual vehicle registrations starting in 2018, as well as a new \$100 annual fee on each electric vehicle starting in July of 2020.⁷

Table 1. State of California Transportation Tax and Fee Rates, Before and After Senate Bill 1 (SB1)

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Source: Adapted from California Legislative Analyst’s Office, Overview of 2017 Transportation Funding Package (2017), <http://www.lao.ca.gov/Publications/Report/3688> (accessed July 25, 2018).

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^c Revenues from the state’s current vehicle registration fee and vehicle license fee are not spent on transportation programs so are not considered in the table.

This report projects transportation revenues through 2040, looking at both the SB1 rates and the rates in existence prior to SB1, both shown in Table 1. Like all projections, ours rely on numerous assumptions about future trends—gasoline prices, inflation rates, fleet changes, and so on. To reflect this uncertainty, we looked at a wide variety of scenarios; figures portraying these scenarios present bands within which the future values are most likely to fall, given projections made with a set of varied assumptions. We also carefully enumerate the assumptions that were made in all cases using government agency projections and assumptions as our sources. To the extent possible, we also address the sensitivity of the estimates to those assumptions. In the end, however, we have made projections and not predictions, and with the horizon year of 2040 over 20 years away, many unforeseen changes in conditions can and undoubtedly will intervene.

The remainder of the report is organized as follows. Chapter II reviews the major sources of transportation revenue in California at all levels of government and traces the origins of the current systems. Chapter III presents the revenue projections we developed if SB1 remains in place and compares those with projections of revenues should the act be repealed. Chapter IV examines what is known from past research about public attitudes and responses to changing transportation taxes and fees. Because there are many different ways to raise transportation revenue in the future and disagreements as to their costs, benefits, and public acceptability, this chapter should help public officials evaluate policies that might be considered as the financial gains from SB1 diminish over time and if SB1 is repealed. The concluding chapter summarizes the key study findings. An appendix presents the details of the projection methods that were used in Chapter III.

II. HOW WE GOT HERE: THE EVOLUTION OF TRANSPORTATION TAXES AND FEES IN CALIFORNIA

Revenues that support transportation programs in California come from a number of local, state, and federal sources. Each source has its own history, and most sources arose in different periods of crisis. One important source of transportation funding has been general revenues. This source comes with challenges, however, because transportation programs must compete with other state programs—including education and health care—for general fund resources. Transportation programs have employed general fund monies to repay bonds which funded capital investments in transportation. A second major source of transportation revenue is user fees, exemplified by motor fuel taxes, which for nearly a century have been central to California’s transportation finance. Tolls provide user fee revenue as well in the few places they exist. Finally, a third component of transportation revenue, more recent origin, is voter-approved local option transportation-specific sales taxes at the county level, which fund transportation projects enumerated in the measures.

Of course, the state endeavors to maximize the flow of federal transportation funds into California, and it often manages to use the three principal sources of in-state revenue to create a required “match” for federal funds. However, we focus on state funding in this paper. We examine the history of the three essential elements that constitute California’s current sources of transportation revenue and describe why they are likely to require adjustments in the near future. Having so set the scene, we then look at the potential of motor fuel tax user fees to continue to be the major source of transportation revenue.

EARLY TRANSPORTATION IN CALIFORNIA: FROM GENERAL FUNDING TO USER FEES

In the horse and buggy years, streets and roads were funded by local taxes and special assessments on property because the adjacent property owners were thought to be the principal beneficiaries of increased access. These revenue streams gradually became inadequate as dramatic growth of motor vehicle ownership and travel necessitated construction of a statewide system of high capacity intercity highways. Counties and cities financed local streets and roads. The state funded major highways because legislators in the early years of state highways believed that financial responsibility for longer road segments carrying intercity traffic should be borne by the public generally.⁸

Responding to the inadequacy of state roads, in 1901 the California Legislature authorized a continuous and connected state highway system to join county seats and major population centers. The voter-endorsed 1909 State Highway Act established a 34-route, 3,000-mile system financed by \$18 million in road construction bonds to be redeemed out of general revenues, primarily from property and corporate taxes. The initial estimates proved inadequate and the state required additional highway bond measures in 1915 and 1919 to complete and upgrade the system; the additional bond measures increased total state transportation debt to \$73 million.⁹

The state kept spending on roads. But it began to fall behind as it tried to meet its needs, and an early state transportation funding crisis had to be resolved. It soon became apparent that additional sources of revenue were required for maintenance and upkeep of the newly-improved roads. These needs created tension between those who favored sharing the costs among all taxpayers and others who felt that those using the roadways should be primarily responsible for their construction and repair.

Those supporting the new concept of greater reliance on user fees also disagreed about whether some users, such as heavy commercial truck operators, should pay more than private car owners. Already burdened by heavy debt, the state shifted its policy toward “pay as you go” funding programs for intercity highway improvements by adopting various user fees to support ongoing maintenance and road repair. For example, the Motor Vehicle Act of 1913 required annual vehicle registration fees that varied based on engine horsepower to reflect roadway damage by larger vehicles.¹⁰

Because of the damage done by heavy trucks using roadways designed for lighter loads, California began collecting weight-based vehicle registration fees on commercial vehicles in 1915. The revenue was earmarked for maintenance, repair, widening, and reconstruction of local roads and state roads and highways. It could not be used to retire the highway construction bonds issued earlier, which remained a general obligation of all state taxpayers. The state supplemented its commitment to building and maintaining its roadways with federal funds following passage of the Federal Aid Highway Act of 1916, and the Rural Post Roads Act of the same year, which provided up to \$10,000 per mile over five years to states for constructing rural post roads.¹¹

As more families acquired cars and commercial travel grew, California’s state and local governments continued to borrow funds to keep up with rising demand. By 1923, state and county road construction debt reached \$114.2 million.¹² Most of the authorized bonds had repayment periods as long as 40 years, which was longer than the useful lifespan of many of the roads being constructed, so maintenance and expansion continued to strain state finances. Even as the state was spending a large share of its revenue to pay off long-term bonds for road construction and highway maintenance, it was falling further into debt.

Responding to a pervasive sense of crisis, California emulated Oregon by adopting a motor fuel tax as a “user fee.” The 2-cent per gallon tax enacted as part of the 1923 California Vehicle Act was intended to be similar to a toll: the more one drove, the more one paid in fuel taxes. The fuel tax was less expensive to administer than tolls because it did not require building and staffing tollbooths, but it was also an “indirect” user fee because one did not pay at the time and place of travel.

At the time, car-owning households and truckers still comprised a minority of all households and businesses. It thus seemed fair to charge road users more than members of the general public. Fuel taxes were supplemented by fixed license and registration charges, as well as higher variable weight fees and business taxes on commercial trucks, which cause proportionately more damage to road surfaces than passenger vehicles.¹³

Collectively, three measures constituted a comprehensive though complex mix that provided ongoing highway support. These included: (i) the gasoline excise tax; (ii) increased weight-based vehicle registration fees; and (iii) a gross receipts tax paid by businesses at different rates depending on their annual volume of sales. Together these shifted the various burdens for maintenance and improvement of state and county highways away from property owners and toward road users and businesses. It allocated at least some of the costs in proportion to road usage and wear. Having been established as a fundamental element of transportation finance in California, the gasoline tax, diesel fuel tax, vehicle registration fees, and truck weight fees all produced a steadily increasing stream of revenue as automobile and truck ownership and use likewise grew steadily for decades through to the present day. The tax rates and fees were raised periodically to reflect inflation, but for nearly a century user fees have been central to transportation finance in California.

POST-WORLD WAR II FUNDING

Automobile purchases and traffic grew dramatically after World War II. Major system expansion needs were recognized and prompted long debates in Washington about a national system of major highways. At the same time, California faced another funding “crisis” that led to increases in the tax rates in 1947 and 1953. While steady growth in travel meant increasing fuel use and rising fuel tax revenue, over time inflation took a toll on the value of the revenue. Inadequate revenues again produced arguments and compromises that raised the user fees in the early 1990s. User fees, including enormous infusions of federal revenue derived from national fuel taxes, largely financed the construction of California’s interstate highways after 1956.

Even as user fees grew as the principal source of transportation revenue in California, the state continued to rely on general taxation to retire general obligation bonds that also continued in part to finance the system. While users are the direct beneficiaries of the transport system, every citizen benefits from goods movement, access to services, and a wide range of opportunities requiring efficient movement. Policymakers therefore felt justified in relying to some extent on the general taxes and fees levied against all citizens and businesses. And, as the state developed an intercity rail program and urban public transit facilities in more recent decades, it was considered appropriate that road users not be solely responsible for transportation revenue.

In 1989, for example, the state faced a purported \$1.6 billion “shortfall” in the state budget (\$666 million of that in the highway program alone), and again confronted the challenge of upgrading its aging transportation system. The California Legislature responded to that particular crisis by passing legislation known as the Blueprint for the Twenty-First Century.¹⁴ The Blueprint both raised user fees and authorized the use of general obligation bonds for transportation.

By raising taxes, the Blueprint provided \$18.5 billion over ten years for capital street and highway improvements as well as intercity and interregional rail projects. The law increased truck weight fees by 55% and doubled the state gasoline and diesel excise tax rates over five years from 9 cents per gallon to 18 cents per gallon by 1994. Since voter approval is required to raise state spending limits, the legislation also included a state

constitutional amendment, enacted by passage of Proposition 111 in 1990, to authorize the tax increases.¹⁵

A centerpiece of the Blueprint was raising \$3 billion from the sale of general obligation (GO) bonds for intercity rail, commuter rail, and rail transit programs known as the Costa Rail Transportation Act. Voters in 1990 approved the first \$1 billion authorized in Proposition 108—the Passenger Rail and Clean Air Bond Act—along with Proposition 111. Voters also approved an independently-sponsored initiative measure on the same ballot, Proposition 116—the Clean Air and Transportation Improvement Act—which authorized nearly \$2 billion in additional bonds for intercity and commuter rail facilities.

Motor fuel consumers and vehicle owners who pay transportation fees, represented by the Automobile Clubs and the California Trucking Association, have aggressively sought to protect revenues generated by those fees from what is called “diversion,” which is the use of those revenues for state purposes other than transportation. Article XIX of the California constitution, for example, requires that per gallon transportation excise taxes on fuel be deposited in a special state account and to be spent exclusively on transportation programs. Proposition 42, enacted by the voters in 2002, also required that state sales tax revenues on fuel be similarly reserved for transportation, though it allowed some diversion of those funds to other state purposes when a fiscal emergency is declared.¹⁶

THE DECLINE OF TRADITIONAL SOURCES AND RISE OF LOCAL-OPTION TRANSPORTATION SALES TAXES

Inflation-adjusted state and federal funding of transportation projects has been decreasing gradually for decades, and steady improvement in vehicle fuel economy means that per vehicle mile of travel the funding decline has been even greater. California’s 18-cent per gallon base gasoline excise tax remained unchanged between 1993 and the passage of SB1 in 2017. The federal fuel tax rate has not changed since 1991 and federal funding for transport has declined in relation to growth in population and GDP, even with several infusions of general fund monies to complement user fees by “bailing out” the Federal Highway Trust Fund as it has sunk into deficits.¹⁷

The average fuel economy rating of new vehicles sold in July of 2017 stood at 24.4 mpg, more than twice the rating of new vehicles sold in the 1970s.¹⁸ Unless federal regulations are relaxed, a change that is under consideration by the Trump administration, light duty vehicle fuel economy is slated to reach more than 40 miles per gallon by 2021.¹⁹ Reluctance is widespread among elected officials to increase fuel excise taxes, in part because the base price of refined fuels has increased and motorists are thought to respond angrily to increases in price at the pump even without knowing the proportion of the total price that consists of taxes.

Since the 1980s, the growing gap between transportation program needs and revenue has been partly met in California by accelerating adoption of voter-approved county sales tax measures for transportation. Local option sales taxes (LOSTs) for transportation are currently in place in 24 of California’s 58 counties that house 88% of the state’s population.²⁰

LOSTs have been growing in number and importance since the first one was adopted in Santa Clara County in 1976. The measures enacted since the early 1990s in the so-called “self-help counties” have had to be approved by two-thirds voter majorities because of changes in the state constitution, but the higher hurdle has not slowed their adoption. Sales tax revenues dedicated to transportation today produce over \$4 billion per year for transportation construction and maintenance in the self-help counties.²¹

Transportation sales tax measures produce essential revenue for the maintenance, operation, and expansion of some transportation facilities and services. But one important drawback of sales taxes is their “regressivity,” meaning that they collect larger shares of household income from lower-income households, on average, than from upper-income ones. This is widely considered to be unfair. While fuel taxes are similarly regressive with respect to income, their incidence rises and falls in proportion to fuel consumed—and thus in rough proportion to road system use. Transportation sales taxes, by contrast, are levied on a variety of consumer purchases, and their payment is less related to travel. This means that light users of transportation systems tend to pay more in transportation sales taxes per mile travelled than heavy users of transportation systems. In this way, transportation sales taxes have been called “doubly regressive.”²²

Despite their regressive nature, LOSTs for transportation have proven to be politically popular. Voters seem to prefer taxes that are levied in small increments over many sales transactions (e.g., a sales taxes of a half-cent per dollar), as compared to taxes paid less frequently and in larger amounts, such as property or income taxes. They also favor such measures because projects to be funded by the LOSTs are specified in the ballot measures and their taxes fund improvements in their own communities rather than far away from those who pay the taxes. The measures are also popular because voters get to enact the projects through direct democratic action.

Most LOSTs in California are enacted for periods of 15 to 40 years, and voters also appear to value the fact that they need to be “reauthorized” where they are effective and that they can “sunset” if they are not. Only a few are permanent, including those in the state’s most populous county, Los Angeles. These measures have often been debated due to concerns over their fairness—to light users of transportation systems, to low-income households, to minority communities, to users of travel modes that receive little funding, and across geographies within and between counties. But voters also travel, and they have demonstrated by their votes that they favor such measures.

CALIFORNIA CONSIDERS MORE DIRECT ROAD USER CHARGES

The transportation revenue sources described above are all critically important to California’s financing of transportation operations, maintenance, renewal, and system expansion. Motor fuel taxes will continue to raise a major portion of needed revenue if SB1 remains in place, and for the foreseeable future fuel taxes will constitute the state’s principal transportation user fee.

In the medium to longer term—over one or more decades—motor fuel tax revenues will continue to decline because of a transition to non-petroleum-based sources of energy and

reluctance to tax alternative energy because doing so might slow that transition. To the extent that the state can rely upon them, transportation agencies will continue to require allocations of general revenues, particularly to support public transit across the state because transit cannot generate sufficient revenues through fares to be viable. There are critical competing uses for state general revenues, however, which provide for the health, education and general welfare of the population.

For these reasons, general state revenues, while important, cannot be the primary source of revenue for transportation. Vigorous competition for every dollar of general revenue ensures that it cannot provide a reliable, predictable flow of funds to enable funding the statewide transportation system in a carefully planned manner over decades. Federal support for transportation is declining, and California has increasingly recognized that the state must rely on its own resources. Local option sales taxes have for several decades been filling growing gaps between program needs and traditional revenue sources. County taxes are appropriately funding transit operations and maintenance, and the operations and expansion of highway facilities, including state facilities, in their own jurisdictions.

Accounting for the increased revenue that will result from SB1, California will still require additional revenue to address maintenance, operation, and expansion of state-owned facilities, particularly intercity projects and projects in many jurisdictions that are of significance to the entire state. The flow of funds established by LOSTs is critical in many counties, especially in Los Angeles where hundreds of billions will be earned over coming decades. Other counties may well renew sales taxes when current measures expire. But it is not likely that county LOST taxation rates will increase dramatically.

Because of concern that California might be unable to rely on user fees when the productivity of motor fuel taxes decreases over coming decades, the legislature in September 2014 enacted and Governor Brown signed SB 1077. This law required the state to design and administer a pilot program testing a road charge system in which vehicles pay for road use directly rather than through fuel taxes. The legislation required that the test employ a flat fee per mile of travel and that it not incorporate congestion pricing or fees that vary with vehicle type. The legislation prohibited the trial from charging participants real money, so it is best considered to have been a simulation of a road charge in which participants received monthly bills by e-mail and paid using simulated credit cards. While other states, most notably Oregon, have been conducting trials for some time, the California pilot test was the largest trial of direct user charges conducted in the United States at that time.

The California Transportation Commission and the State Transportation Agency designed the pilot test relying on the advice of a 15-member Technical Advisory Committee (TAC) that studied all aspects of road charging, emphasizing, as stated in the law, the protection of privacy, data security, and exploring alternative technologies from odometer readings to smart phones to vehicle telematics. The TAC heard from many experts and interest groups and consultants conducted surveys and focus groups of citizens. Citizens were invited to volunteer as participants, and efforts were made to recruit participants from every region, from all socioeconomic groups, and fleet vehicles, including heavy trucks. The program was widely publicized on websites and through publications, for example, including *Westways*, the bimonthly magazine of the Automobile Club of Southern California.

The pilot program began in July 2016 and ended in March 2017. Over 5,400 participating vehicles drove 37,258,866 miles during the trial. Drivers chose among six different methods for reporting their mileage. These methods included low-tech options such as a mileage permit consisting of a sticker placed on the windshield, periodic odometer readings at state facilities, and higher tech options including monitoring travel by smart phone. Also included were installations of monitoring devices in vehicles' on-board diagnostics (OBD-2) ports or use of telemetric devices already operational in newer vehicles.

Participating vehicle owners could choose to have their locations tracked or could opt for mileage reporting that did not keep a record of their locations. The several program options were managed by contractors to the state in order to test the ability of third-party vendors to deliver the program. Drivers received monthly simulated credit card bills and could, if they chose to, access web sites that reported on the condition of their monitored vehicles and rated their driving in terms of safety and rapid accelerations. They could also receive other program updates electronically. Participants could access helplines if they had problems or questions and were surveyed at the middle of the trial and after it ended.

The pilot test concluded on schedule and was deemed a success by the TAC. Very few participants dropped out of the trial, and those who did had reasons such as illness, becoming carless, or moving out of state rather than dissatisfaction. Some 85% of those participating in the program reported being satisfied or very satisfied with the trial. Seventy-three percent reported at the end of the program that they regarded direct user fees to be "more fair" than a gas tax.²³

NEXT STEPS FOR CALIFORNIA ROAD CHARGE PROGRAMS

The trial of direct road user fees was a technical success, but the future of direct road charges in California remains uncertain, and the trial marks an early milestone on a path that will unfold over decades. Responding to growing national interest in direct user charges as potential successors to the venerable motor fuel user fee, the most recent federal transportation legislation, the Fixing America's Surface Transportation (FAST) Act, enacted in December 2015, appropriated \$95 million for states to continue trials, tests, and demonstrations of direct road charges. California was awarded \$750,000 in late 2016 to advance the concept further by field testing a program that would charge a direct road charge based on miles driven but collected at fuel pumps when vehicles purchase fuel.²⁴

Because today the excise tax is part of the fuel purchase price, the concept to be tested would facilitate a transition to a new form of charging using electronic communication between the vehicle and the fuel pump to cancel the tax on the fuel for participating vehicles. It would instead charge them for miles driven since their last fuel purchase. This process would be convenient for drivers who own vehicles that use petroleum fuel, but would require an alternative for electric or hydrogen-fueled vehicles. A provision of SB1 required that a study be conducted of a possible user fee in the form of a surcharge on the cost of electricity when vehicle batteries are charged. This is presently under study at the Institute of Transportation Studies at the University of California Davis, and a report will be made to the legislature by the end of 2018.

California is also actively participating as one of 14 states that together formed the Western States Road Use Charge Consortium (RUC West). RUC West received another \$1.5 million in federal funding to collaborate in order to advance planning for an integrated multi-state charging system. As trials proceed in Washington, Oregon, Nevada, and other nearby states, as well as in California, this collaborative intends to share information and compare lessons learned. Most importantly, it would ensure that the implementation of any future programs is operationally compatible across many states.

THE IMPORTANCE OF SB1 REVENUE PROJECTIONS

California is in the midst of a transition. For the foreseeable future, motor fuel taxes and local option sales taxes will continue to produce revenue for transportation capital, maintenance, and operations, and general fund transportation obligations will continue to be honored even as new commitments of general revenues decline. The transition to ever more fuel efficient and clean-fueled vehicles will accelerate. Direct user fees will continue to be explored and tested but they will not necessarily be adopted and if they are it will take decades to implement them. Because there are so many sources of potential variation and volatility in transportation revenues, it is important that policymakers understand the current state and future of transportation revenues in California, including the likely impacts of SB1 and the implications of its possible repeal. The next section presents projections of the most likely revenue implications of SB1 during this period of dynamic change. Because it is possible that voters will repeal SB1 in the November 2018 election, the estimates of revenue over time with SB1 in place are compared with projected revenues should the act be repealed.

III. PROJECTED STATE TRANSPORTATION REVENUES WITH AND WITHOUT SB1

This chapter presents projections of how much transportation revenue the state of California will collect from 2018 to 2040 from gasoline excise taxes, diesel excise and sales taxes, and road improvement fee revenues. Projections are made for two scenarios: (i) with SB1 in place and (ii) with the tax and fee structure that was in place just prior to SB1. The state would revert to those should SB1 be repealed and new taxes or fees to replace the lost revenue would require additional new legislation. In addition to projected total revenues per year, we also projected annual revenues per registered vehicle and per vehicle mile traveled (VMT), to provide consistent points of comparison across time. The remainder of this chapter describes the forecasting methods, projected total annual revenues under each scenario, and projected annual revenues per capita and per VMT.

METHODS

We projected revenues from three different sources: (i) gasoline taxes, (ii) diesel taxes, and (iii) the annual transportation improvement fee on all vehicles and the road improvement fee that SB1 levies on ZEVs. All revenues are expressed in constant 2017 dollars. Excluded from the forecasts are revenues from taxes and fees levied on vehicles that do not fund the state's transportation programs, such as the Vehicle License Fee, which funds the California Highway Patrol and the Department of Motor Vehicles.

The projections were made using a spreadsheet model summarized in the Appendix for readers interested in reviewing the methods and assumptions. For each scenario—with and without the revenue from SB1—we estimated an upper bound, a lower bound, and a mean between them which we considered to be the projection most likely to be representative of future possibilities. The range between the upper and lower bounds represents a set of plausible outcomes under different economic conditions. The high and low estimates result from numerous assumptions, summarized in the Appendix, about reasonable ranges of the determinants of revenue. The estimates result from combinations of various factors that cannot be individually associated with probabilities of occurrence, such as vehicle fleet fuel efficiency, the market price of gasoline, and the amount of driving. For that reason, the bands do not indicate a particular level of statistical significance.

We made the projections using a spreadsheet model that calculated annual revenue using inputs derived from multiple sources. In the spreadsheet model, population growth and growing travel demand (VMT) influence the size of the state's motor vehicle fleet and the adoption of electric vehicles. We applied tax rates to fuel sales or and fee rates to the number of vehicles of particular types to estimate revenues described below.

The projections relied upon a widely used set of national projections of energy consumption, including some for transportation energy, prepared by the US Energy Information Administration (EIA) of the US Department of Energy. These are considered authoritative and are widely used by transportation and energy sector researchers and policymakers. Interested readers will find general information about the EIA in their report *Alternative Fuel Infrastructure Expansion: Costs, Resources, Production Capacity, and Retail Availability for Low-Carbon Scenarios*.²⁵

The diesel and gasoline consumption estimates were based on 50 scenarios of future national energy consumption employed in a complex National Energy Model (NEM) that has many components. Interested readers can find a complete explanation of the EIA projection methods in their series of reports entitled *Assumptions to AEO2018*.²⁶ The series explains the national models, assumptions, and projections. The 50 scenarios predict national diesel and gasoline consumption under a variety of future conditions, such as different international prices of petroleum. We used past gasoline and diesel consumption data described in the appendix to calculate California's consumption as a proportion of national diesel and gasoline consumption. We used these proportions to project California's future diesel and gasoline consumption, which in turn allowed us to project California's surface transportation revenues under both SB1 and under repeal. Assumptions relating to particular fuels or fees are presented in more detail in the following sections where the projections for each revenue source are reported. All of the data used in this analysis are publicly available but are not included in this report because they are voluminous. Interested readers may find our complete projections supporting data, and enumeration of assumptions, which are briefly mentioned in this section, at transweb.sjsu.edu/research/1850.

TOTAL ANNUAL REVENUE FORECASTS, BY TAX TYPE

Projected Gasoline Tax Revenues, 2018–2040

Figure 1 shows projected gasoline excise tax revenues with and without the changes introduced by SB1. If SB1 is not repealed, revenue will exceed \$4 billion in 2018 and increase rapidly in the next few years as SB1 provisions are phased in. Annual revenues will increase to \$6.2 billion by 2021. After 2021, annual revenues will decline because of steadily increasing vehicle fuel efficiency. By 2040, gasoline excise tax revenues will approximate or slightly exceed revenues in 2018; 2040 revenues from this source are forecast to be somewhere between about \$4 billion to \$5 billion (in 2017 dollars).

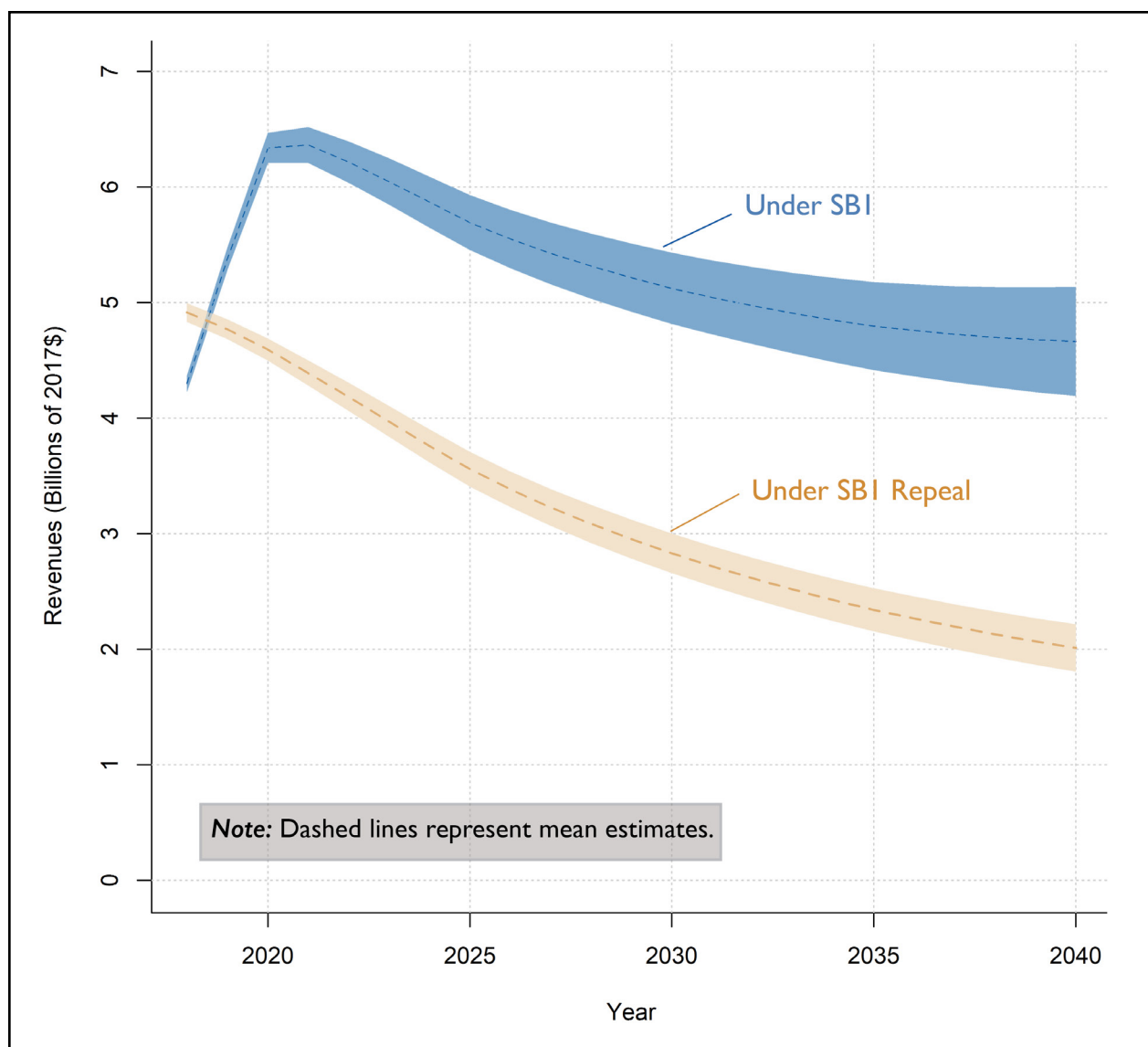


Figure 1. Projected California Gasoline Excise Tax Revenues, 2018–2040

The projections of revenue under SB1 presented in Figure 1 reflect that the base excise tax on gasoline is currently 30 cents per gallon. Effective July 1, 2019, the excise tax will increase to 47.3 cents per gallon, and beginning in 2020 this amount will be adjusted annually on July 1 for inflation using the California Consumer Price Index (CA CPI). The first inflation adjustment in July 2020 will be a percentage equal to the increase in the CA CPI from November 2017 through November 2019. Following this, annual adjustments to the SB1 rate will cover subsequent 12 month periods.

The revenue produced by the gasoline excise tax will be sensitive to gasoline prices and vehicle energy efficiency. Higher gasoline prices and increasingly efficient engines may translate into fewer gallons of gasoline sold each year over time. The volume of revenue received from the gasoline excise tax will be especially sensitive to the number of alternative fuel vehicles on the road because they pay no gasoline excise taxes at all.

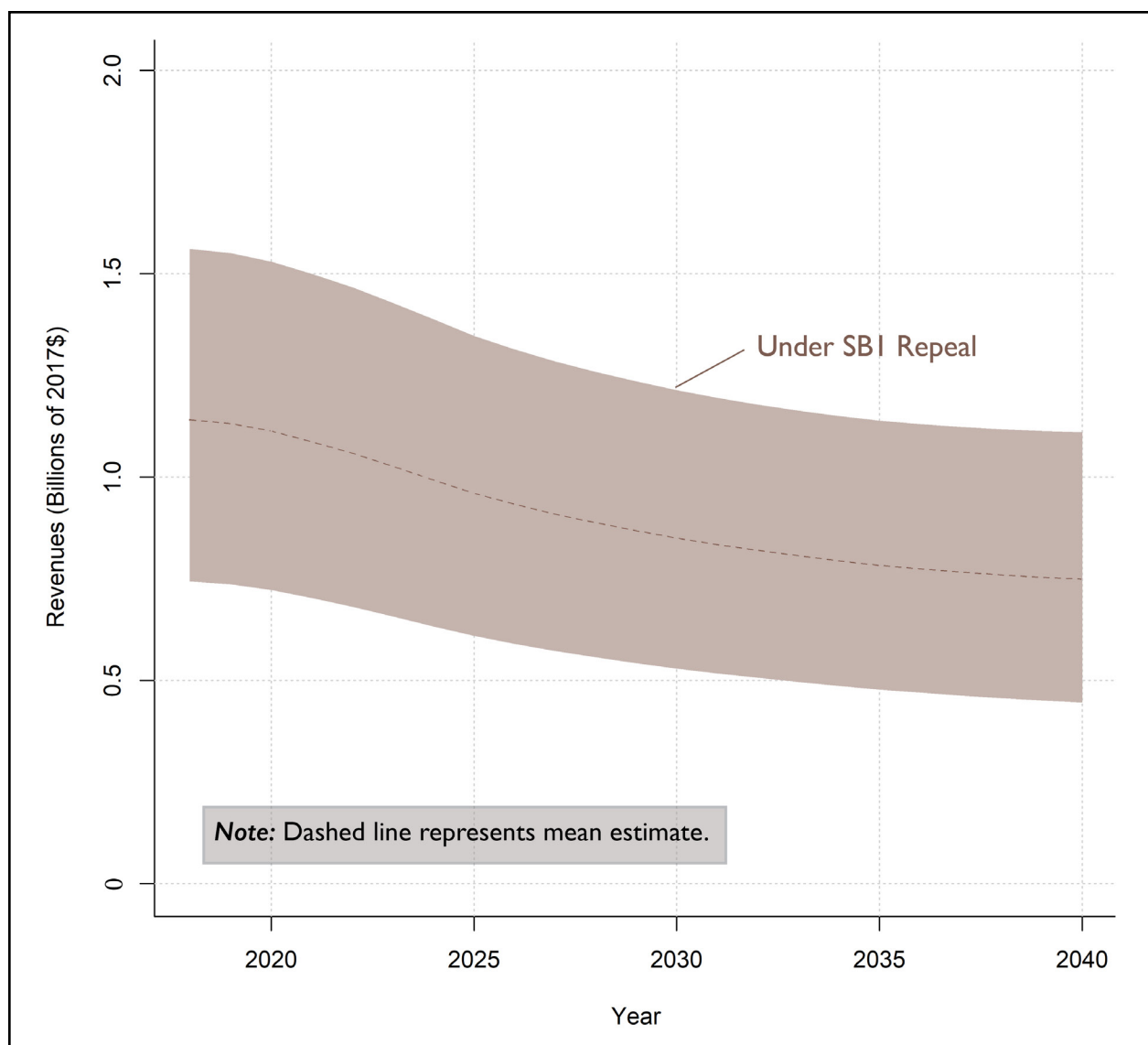


Figure 2. Projected Gasoline Sales Tax Revenue Under SB1 Repeal, 2018–2040

We assumed that all 50 US gasoline consumption scenarios presented by the EIA represent reasonably feasible futures and that California’s share of total US gasoline consumption for transportation purposes, which is currently around 10.2%, will continue to decline by around 2% of that share annually because of the state’s aggressive fuel efficiency policies. We also assumed that the price of gasoline in California will increase approximately 2% annually.

In the absence of the adjustments enacted in SB1, gasoline excise tax revenues will decrease significantly over time. As shown in Figure 1, they will decline from approximately \$5 billion in 2020 to around or even less than \$2 billion by 2040. Our projections assume that the gasoline excise tax rate if SB1 is repealed will fall between 28 cents per gallon and 40 cents per gallon (i.e., historical upper and lower rates from 2010–2017).

SB1 replaces the annually adjusted sales tax on gasoline that was the result of the 2010 “gas tax swap,” and repeal of SB1 would result in a continuation of the gasoline sales tax.

Revenues produced by that tax will also decrease over time. (A description of the gas tax swap can be found in a report by Brown, Garret and Wachs.²⁷) As shown in Figure 2, gasoline sales tax revenues will range from \$800 million to \$1.4 billion in the early 2020s, and by 2040 will fall between \$400 million and \$1.2 billion. Because Proposition 6 provides for no alternative, our projections assume that, if SB1 is repealed, the gasoline sales tax rate will be set at the 2.25% pre-SB1 rate that was in place prior to 2010.

Projected Diesel Excise Tax Revenues, 2018–2040

To arrive at the projections in Figure 3 we began with the base excise tax on diesel fuel, which is 36 cents per gallon in 2018. This rate will be adjusted under SB1 annually on July 1 for inflation using the California CPI beginning July 1, 2020. The first inflation adjustment in July 2020 will be a percentage amount equal to the increase in the CA CPI over the previous 24 months, from November 2017 through November 2019, in order to use an index that is less volatile than would be possible if shorter periods were used. Following July 2020, annual adjustments to the SB1 rate will cover subsequent 12-month periods.

Figure 3 shows that diesel excise tax revenues will stay relatively flat if SB1 is in effect for most of the period from 2018 to 2040. Revenues will be approximately \$1.5 billion annually from 2018 through 2034. After 2034, annual diesel excise tax revenues will increase slightly, and by 2040 annual revenues in the range of \$1.5 billion to \$1.65 billion are projected as a result of growing forecasted truck travel volumes.

Should SB1 be repealed, diesel excise taxes will decline slightly from 2020 to 2040. Diesel excise revenues will be above \$500 million around 2020 and decline to well below \$500 million in 2040. (That is to say, the mean estimate for 2040 is \$380 million, with a range between \$363 and \$400 million.) Whether or not SB1 is in effect, the revenues received from the diesel excise tax will be sensitive to diesel prices and vehicle energy efficiency; higher diesel prices and more efficient engines may translate into fewer gallons sold.

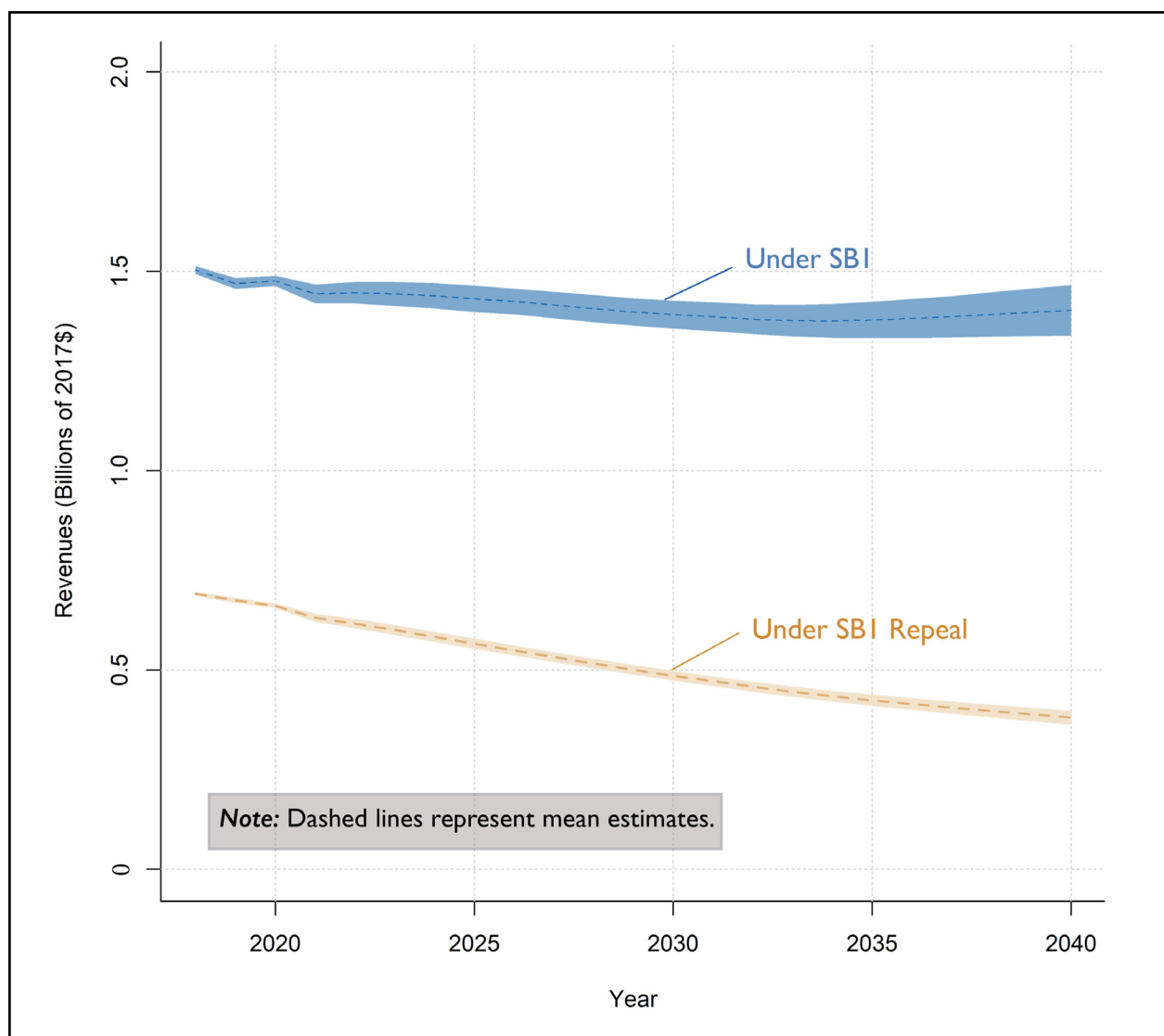


Figure 3. Projected Diesel Excise Fuel Tax Revenues in California, 2018–2040

We assumed that all 50 US diesel consumption scenarios presented by the EIA represent reasonably feasible futures and that California's share of total US diesel consumption for transportation purposes, currently around 7.5%, will continue to decline very gradually by around 1% of its current share annually (i.e., California's share of all diesel sold will decrease by 0.006% per year) as California standards demand adoption of more fuel efficient trucks than do other states. We also assumed that the price of diesel in California will increase approximately 2% annually to keep up with inflation.

Our projections include revenues generated from the International Fuel Tax Agreement (IFTA). Because heavy trucks purchase fuel in states and provinces other than where they drive, an agreement between the lower 48 states of the United States and the Canadian provinces requires transfers of fuel tax revenues among jurisdictions to reflect road use. Each carrier files a quarterly fuel tax report. This report is used to determine the net tax or refund due and to redistribute taxes from collecting states to states where transfers are due. In the absence of authoritative data from any source, we assumed that all California

IFTA revenues come from diesel sales and that the number of gallons of diesel covered under IFTA will continue to grow by around 7 million annually. We also assumed that the IFTA-specific excise rate will be 40 cents per gallon moving forward (i.e., the average rate from 2006 to 2017).

Projected Diesel Sales Tax Revenues, 2018–2040

As shown in Figure 4, diesel sales tax revenues will be relatively flat from 2018 through 2040. Expressed in 2017 dollars, annual diesel sales tax revenues will range from approximately \$600 million to \$1 billion over this entire period. Of all the revenue sources included in this study, the diesel sales tax is projected to be the most stable over time because the diesel sales tax rate was not pegged to inflation before SB1 and will not be pegged to inflation afterwards.

The current diesel-specific sales tax is set at 5.75% of the price of diesel fuel removed from the rack or imported into the state. Because the tax is set as a percentage of the sales price rather than as a tax per gallon, under SB1 this number is not scheduled to be adjusted according to the California CPI. The revenues received from the diesel sales tax will be sensitive to diesel prices and vehicle energy efficiency; higher diesel prices and more efficient engines may translate into fewer gallons sold. We assumed that all 50 US diesel consumption scenarios presented by the EIA represent reasonably feasible futures. As stated above, we also assumed that California's share of total US diesel consumption for transportation purposes, which currently is around 7.5%, will continue to decline by around 1% of its current share annually. We also assumed that the price of diesel in California will increase approximately 2% annually, roughly equivalent to inflation.

The projections include revenues generated from the International Fuel Tax Agreement (IFTA). We assume that all California IFTA revenues comes from diesel sales and that the number of gallons of diesel covered under IFTA will continue to grow by around 7 million annually. We also assume that the IFTA gallons are charged the same 5.75% sales tax as other diesel gallons.

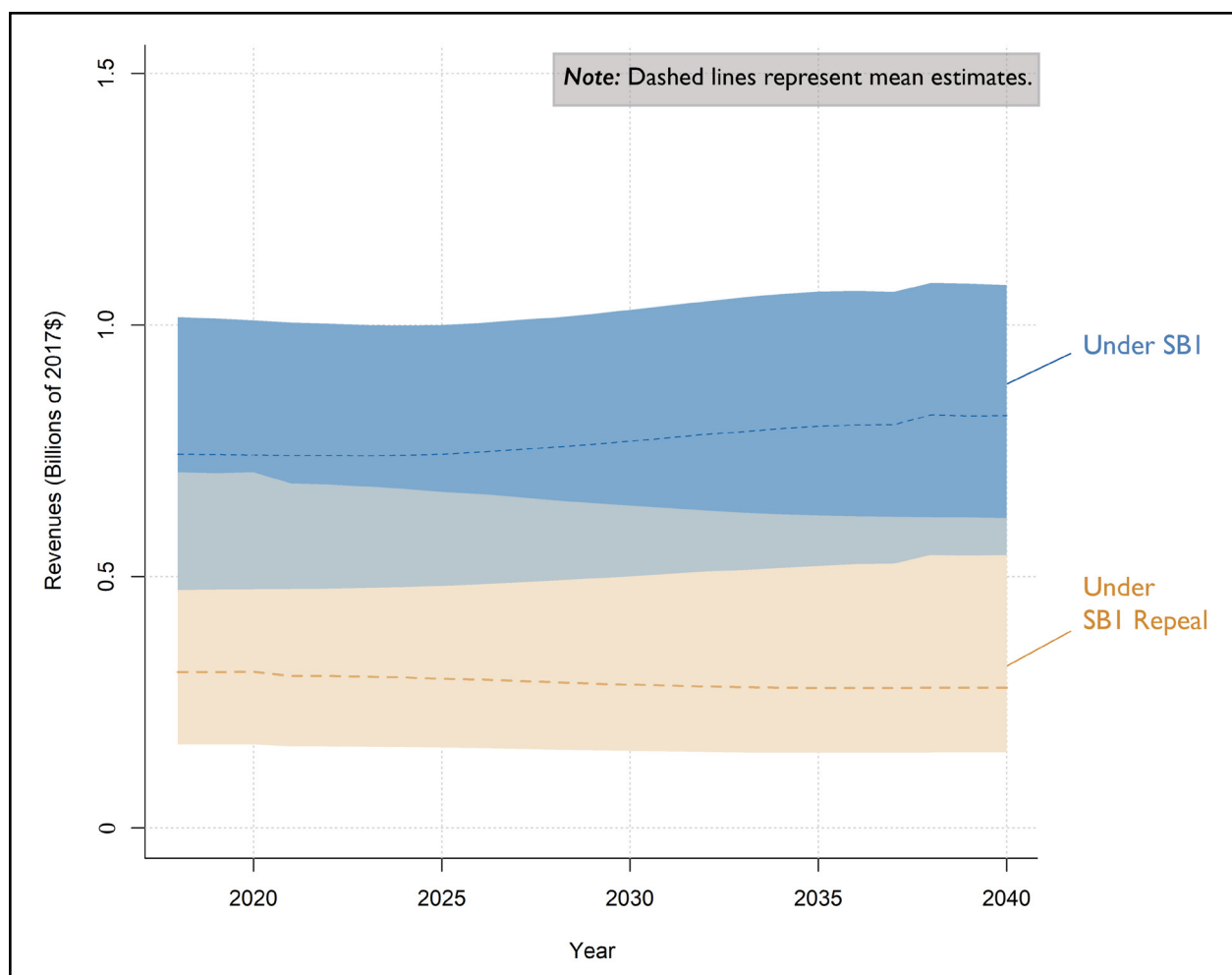


Figure 4. Projected Diesel Sales Tax Revenues in California, 2018–2040

Projected SB1 Transportation and Road Improvement Fee Revenues

In addition to increasing and indexing motor fuel taxes, SB1 imposes two new annual fees on vehicles. The first of these is a Transportation Improvement Fee that varies with the value of the vehicle. Vehicles valued under \$5,000 will be charged an additional \$25 per year at the time they renew their registration. The charge per vehicle increases as vehicle value increases. The maximum fee is \$175 per year, charged to vehicles valued over \$60,000. SB1 does not adjust these annual fees for inflation, and our projections recognized that uncertainty grows greater over time because of several factors. The revenue from the fee can increase should inflation cause the values of vehicles to rise over time, but it can decrease as vehicles become more reliable, are kept longer by their owners, and lose market value as they age. Of course, another uncertainty arises from the fact that the legislature might change the fee schedule over time.²⁸

Figure 5 shows the revenue that we project from this new fee over time. The annual revenue will be relatively predictable at about \$1.7 billion in the near future, and the uncertainty band widens over time because of the factors mentioned above. By 2040, the cumulative revenue from this fee since its inception fee is projected to be about \$39 billion.

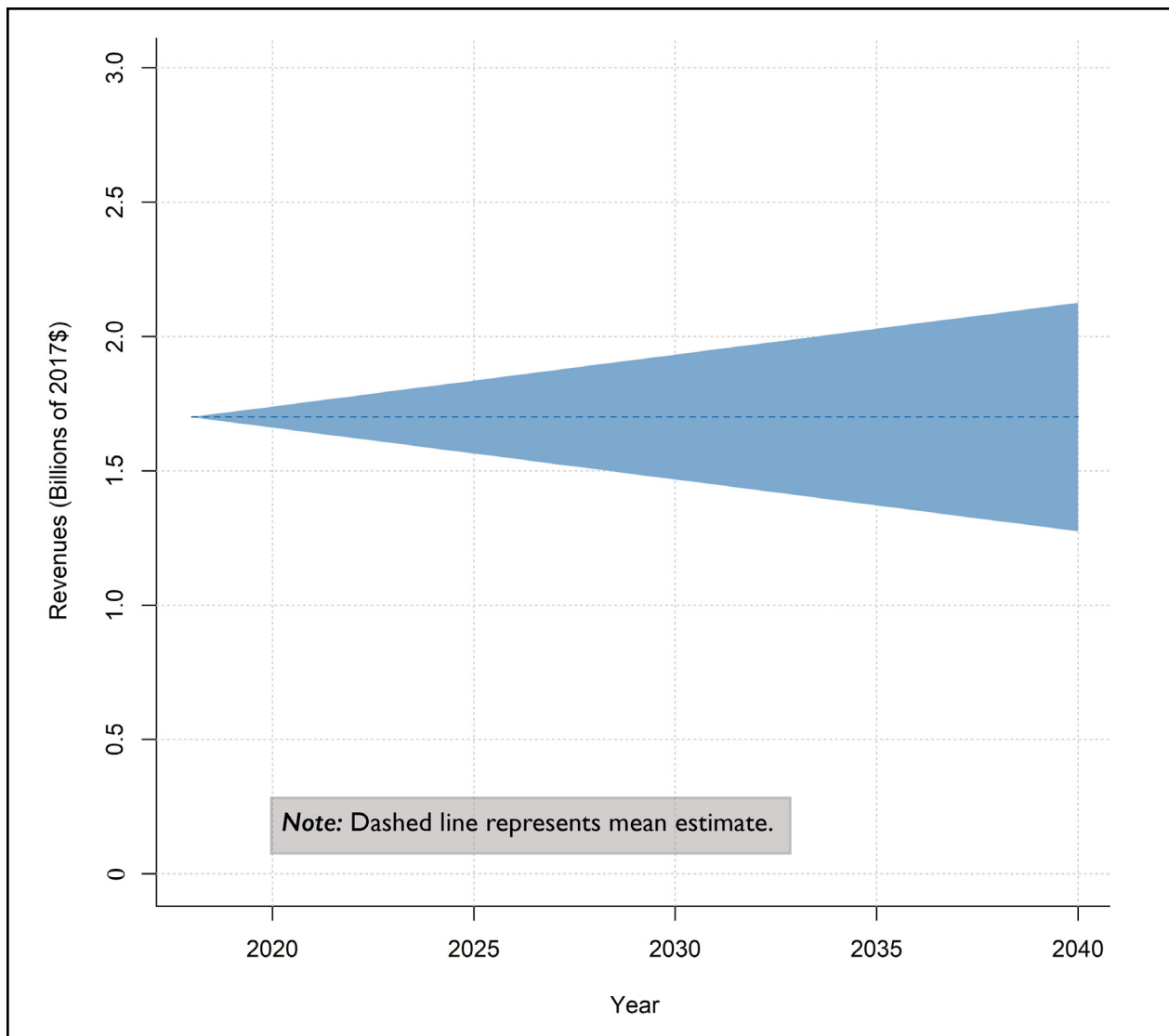


Figure 5. Projected Revenue from the SB1 Transportation Improvement Fee in California, 2018–2040

The second new fee under SB1 is the \$100 Road Improvement Fee assessed on electric vehicles. Of course, there is great uncertainty as to what the adoption rate of EVs will be. As shown in Figure 6, we project that revenues from the road improvement fee imposed by SB1 will increase significantly from 2018 to 2040. Expressed in constant 2017 dollars, mean projected road improvement fee revenues will amount to \$24 million in 2020, the year in which the fee takes effect.

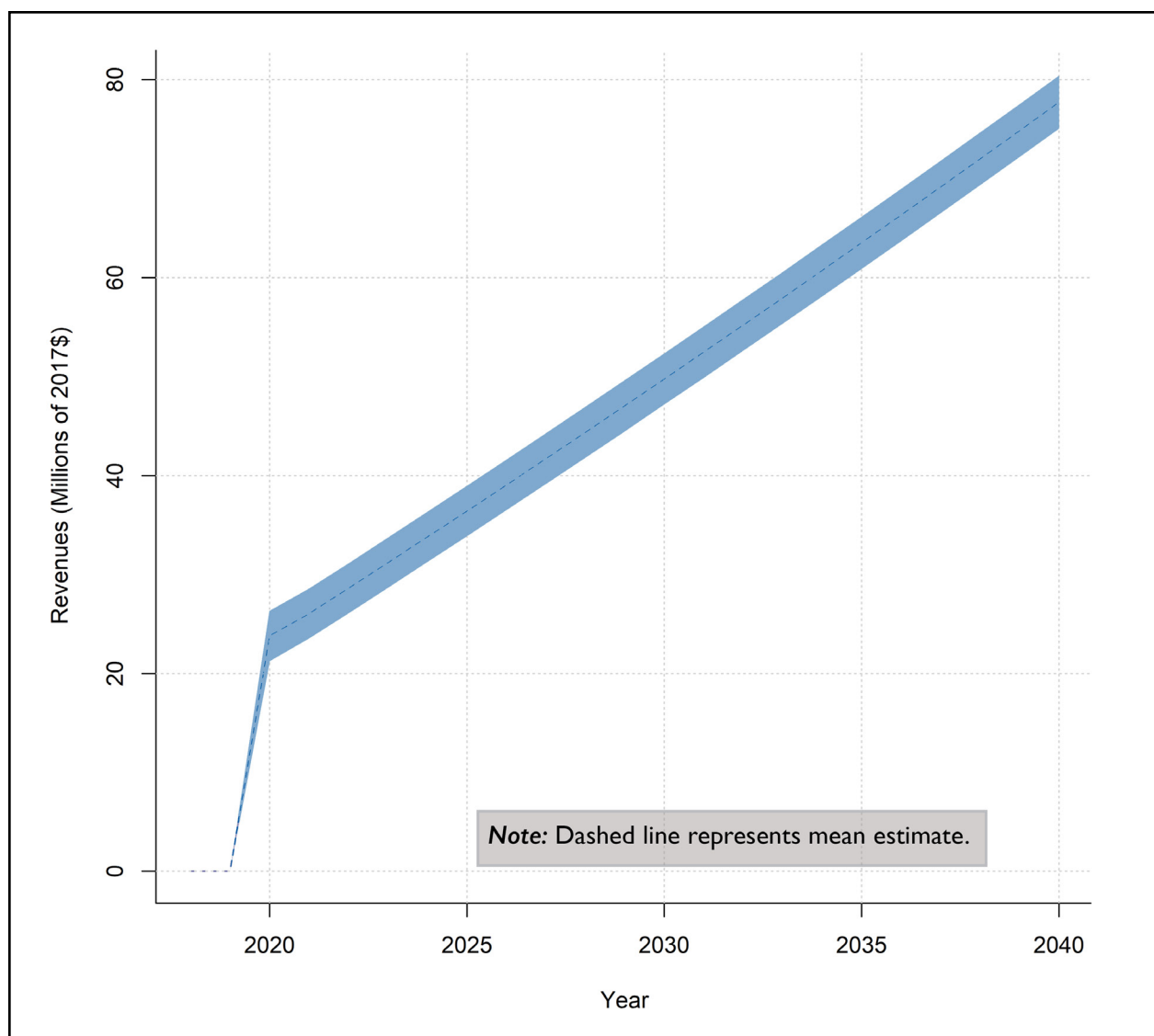


Figure 6. ZEV Road Improvement Fee Revenues in California, 2018–2040

A higher ZEV adoption rate will translate into more road improvement fee revenues, while a lower ZEV adoption rate will translate into comparatively lower road improvement fee revenues. We assumed that the number of ZEVs registered in California will continue to increase by approximately 27,000 per year and that only electric and hydrogen fuel cell vehicles will be classified as ZEVs. This assumption could become incorrect if California adopts new policies, such as much larger rebates for the purchase of electric vehicles, or should gasoline prices rise precipitously. The fee will be set at \$100 effective July 2020. Beginning January 1, 2021, the road improvement fee will increase by an amount equal to the increase in the CA CPI for the prior year. The first adjustment on January 1, 2021, will only account for the previous six months' increase in the CPI. We assume that inflation will continue to increase by approximately 2% per year. If SB1 were to be repealed, there will be no road improvement fee, so future revenue from that potential source would be zero.

PROJECTED TOTAL TRANSPORTATION REVENUE

Combining the information from the foregoing projections, Figure 7 shows on the same graph the projected state revenues through year 2040 from each tax and fee with SB1 in place, and Figure 8 shows the revenue projections over the same time period should SB1 be repealed. Figure 9 shows the total projected revenue both with and without SB1.

A comparison of these figures shows that repeal of SB1 would result in significantly less surface transportation funding over time. For 2020, the mean projection is that the state will collect \$10.4 billion with SB1 in place and \$6.6 billion without it, a difference of \$3.8 billion. Over time, changes in fuel economy and other factors will change annual revenue. By 2040, the mean projection is that the state will collect \$8.6 billion with SB1 and \$3.4 billion without it, a \$5.2 billion difference. Between the passage of SB1 in 2017 and 2040, the repeal could reduce projected transportation revenues by a total of \$100 billion unless, of course, alternative sources are tapped to address the shortfall. Without SB1, transportation revenues will decline steadily over time. With SB1 in place, surface transportation revenues will increase for several years in the short term, decline slightly, then flatten out over the medium term.

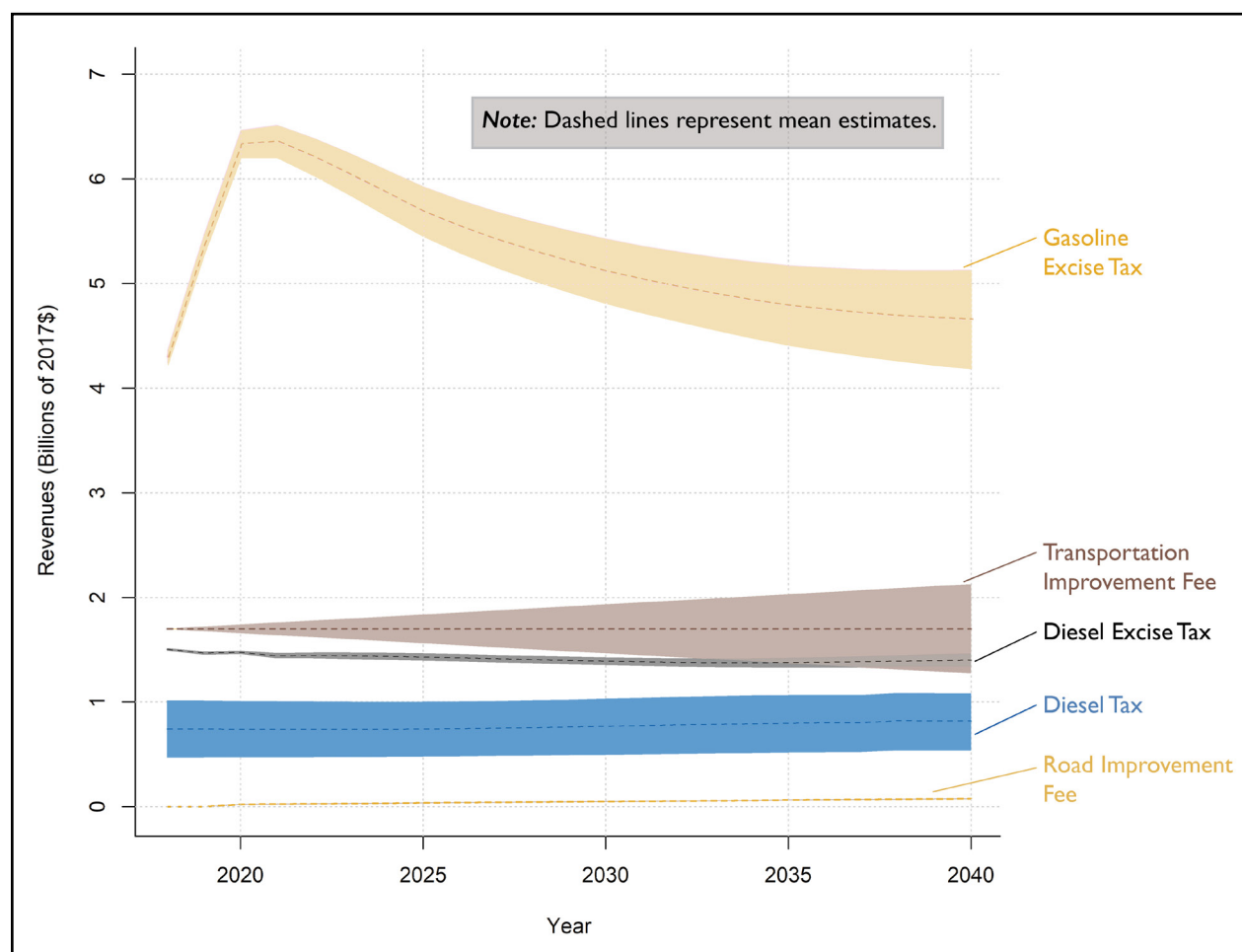


Figure 7. Projected Annual Revenue for Each Source Under SB1, 2018–2040

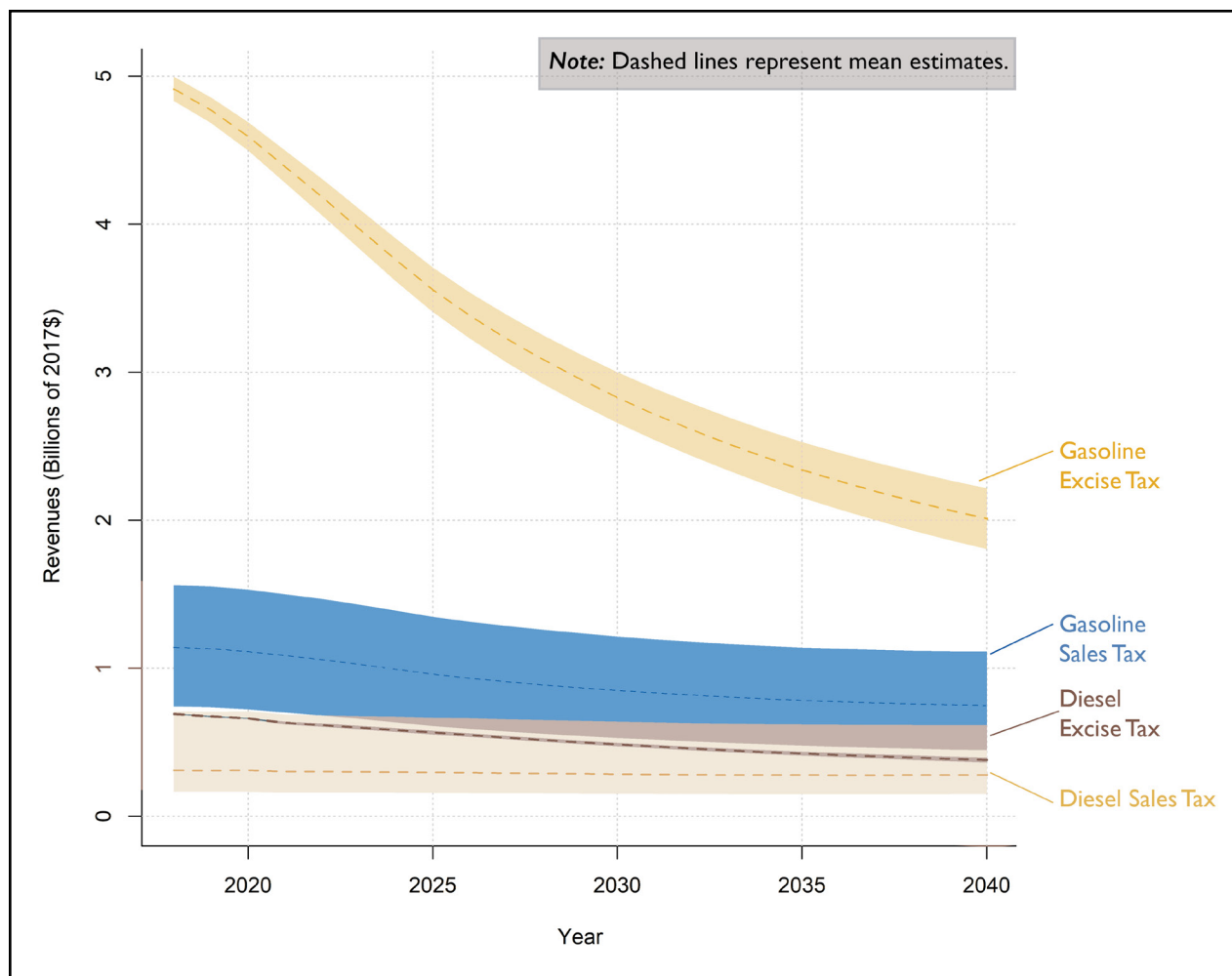


Figure 8. Projected Annual Revenue for Each Source if SB1 is Repealed, 2018–2040

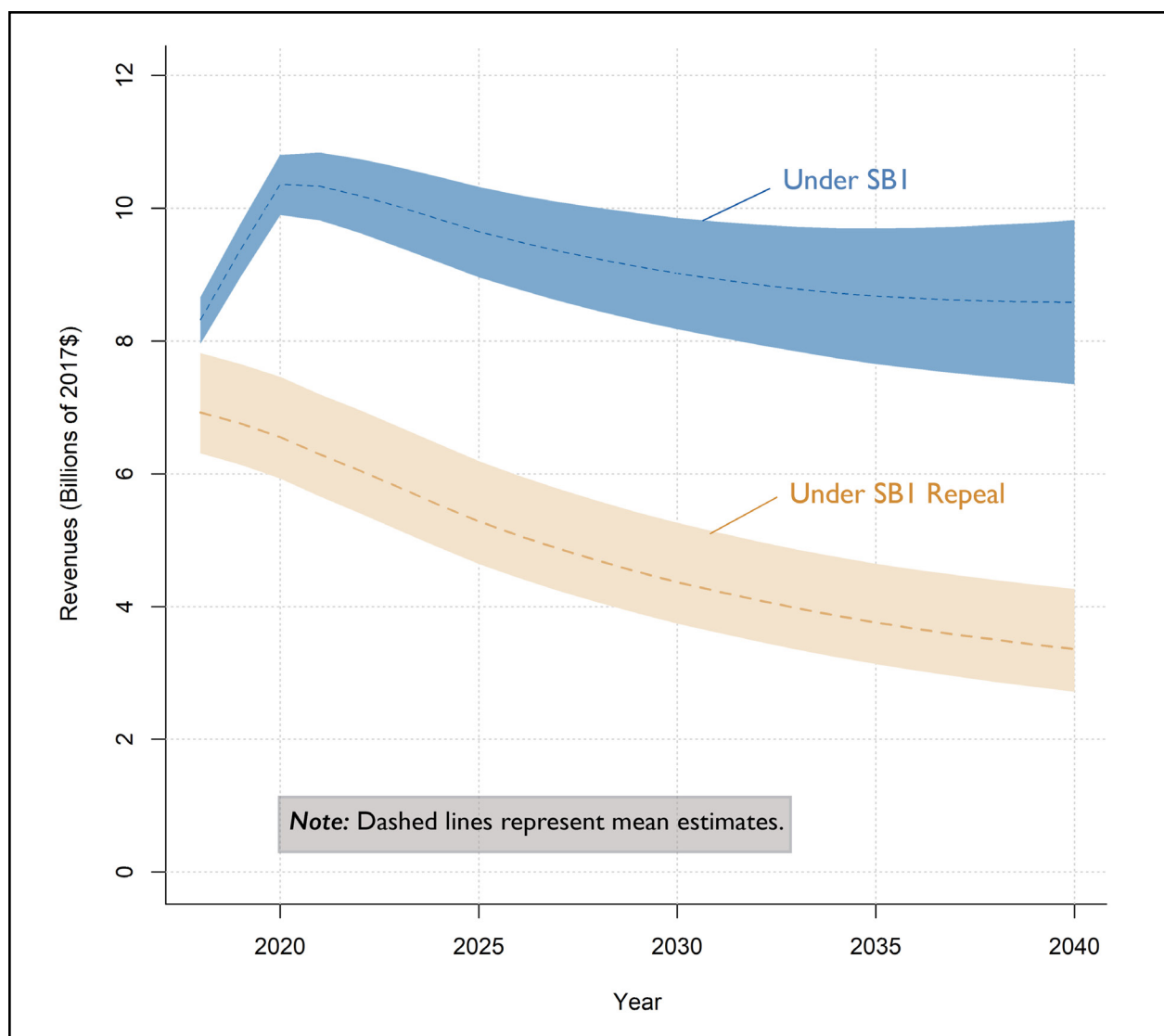


Figure 9. Projected Total Transportation Revenue Collected Under SB1 and its Repeal, 2018–2040

It is also of interest to compare how the composition of total transportation tax revenue would change should SB1 be repealed. As shown in Figure 10, if SB1 is not repealed, gasoline excise tax revenues will constitute the greatest share of all the revenue instruments to total revenue. The share of revenue produced by gasoline excise taxes will increase over the next several years, peak at around half of total revenue in 2022, and decline through 2040. The share of revenue coming from diesel sales and excise tax revenue is projected to be fairly constant over this same time period. The Transportation Improvement Fee revenue from conventional vehicles will produce an amount of revenue similar to that collected from the diesel excise tax. In contrast, revenue from the new Road Improvement Fee on EVs is projected to constitute an increasing share of total revenue, but will still constitute less than 1% of total revenue by 2040. The Road Improvement Fee, unless it is increased in the future, will generate only a modest amount of revenue. The fee is highly symbolic, however, marking the first time in California that electric vehicles are expected to contribute to the cost of maintaining the roads that they use.

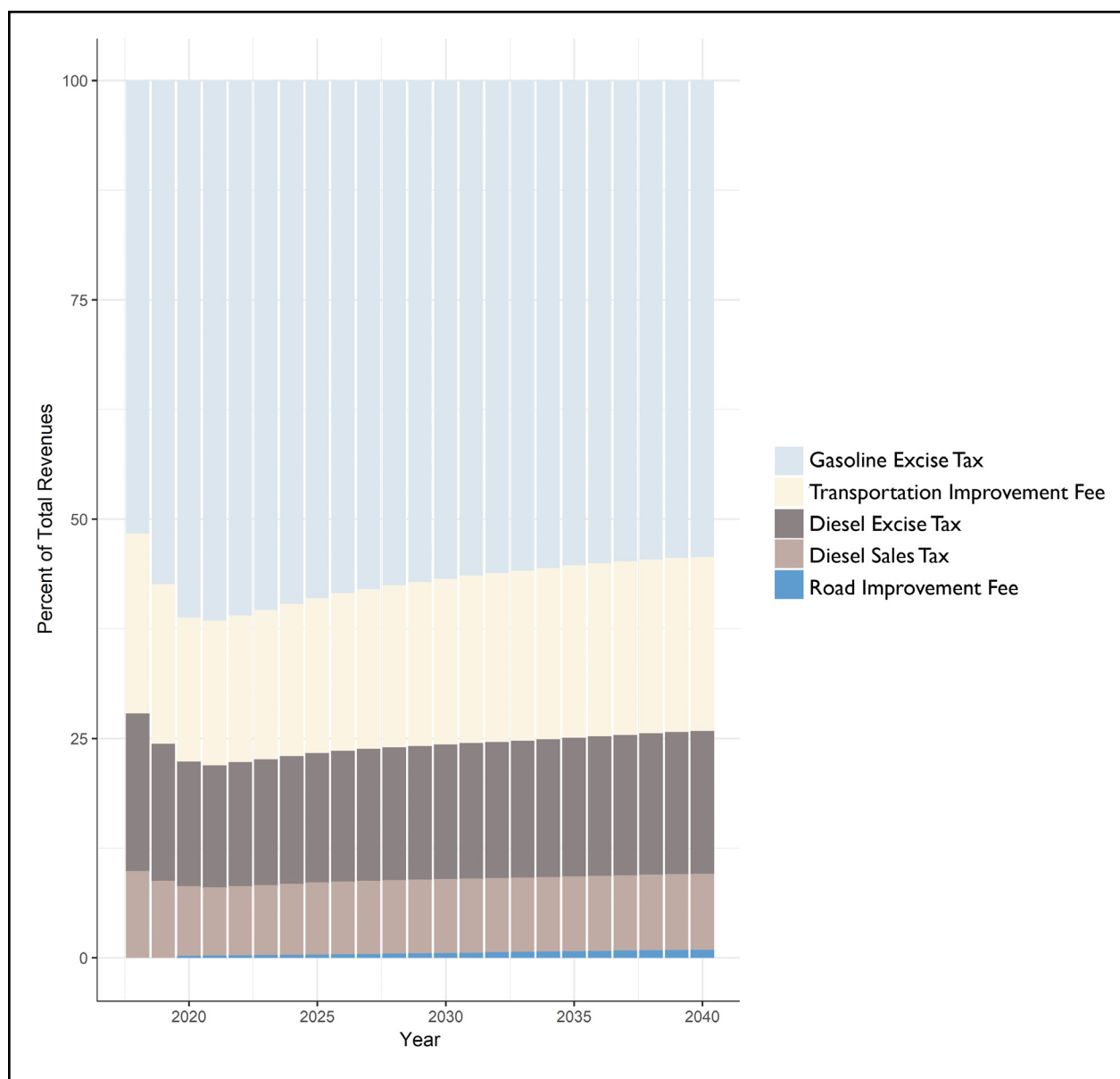


Figure 10. Percent of Revenue by Source Under SB1, 2018–2040

The change in the composition of revenue, shown in Figure 10, will stem mostly from the declining purchasing power of the gasoline excise tax rather than from increases in the relative value of the diesel excise tax, diesel sales tax, or Road Improvement Fee revenue.

Should voters repeal SB1 in November 2018, Figure 11 shows that gasoline excise taxes will remain a significant but declining proportion of total funding through 2040. Gasoline excise taxes will constitute around 70% of total revenue in 2018 and decline to around 59% by 2040. Gasoline sales taxes will constitute 16% of revenue in 2018 and increase to 22% of revenue by 2040, while diesel excise taxes will stay steady at approximately 10% of revenue over the entire period. Diesel sales taxes will grow from approximately 5% of revenue in 2019 to around 8% in 2040.

Because the gasoline tax is the largest source of revenue whether or not SB1 is repealed, the state must actively consider alternative forms of revenue for transportation as it implements its plans to reduce greenhouse gases by transitioning to vehicles that are not powered by petroleum.

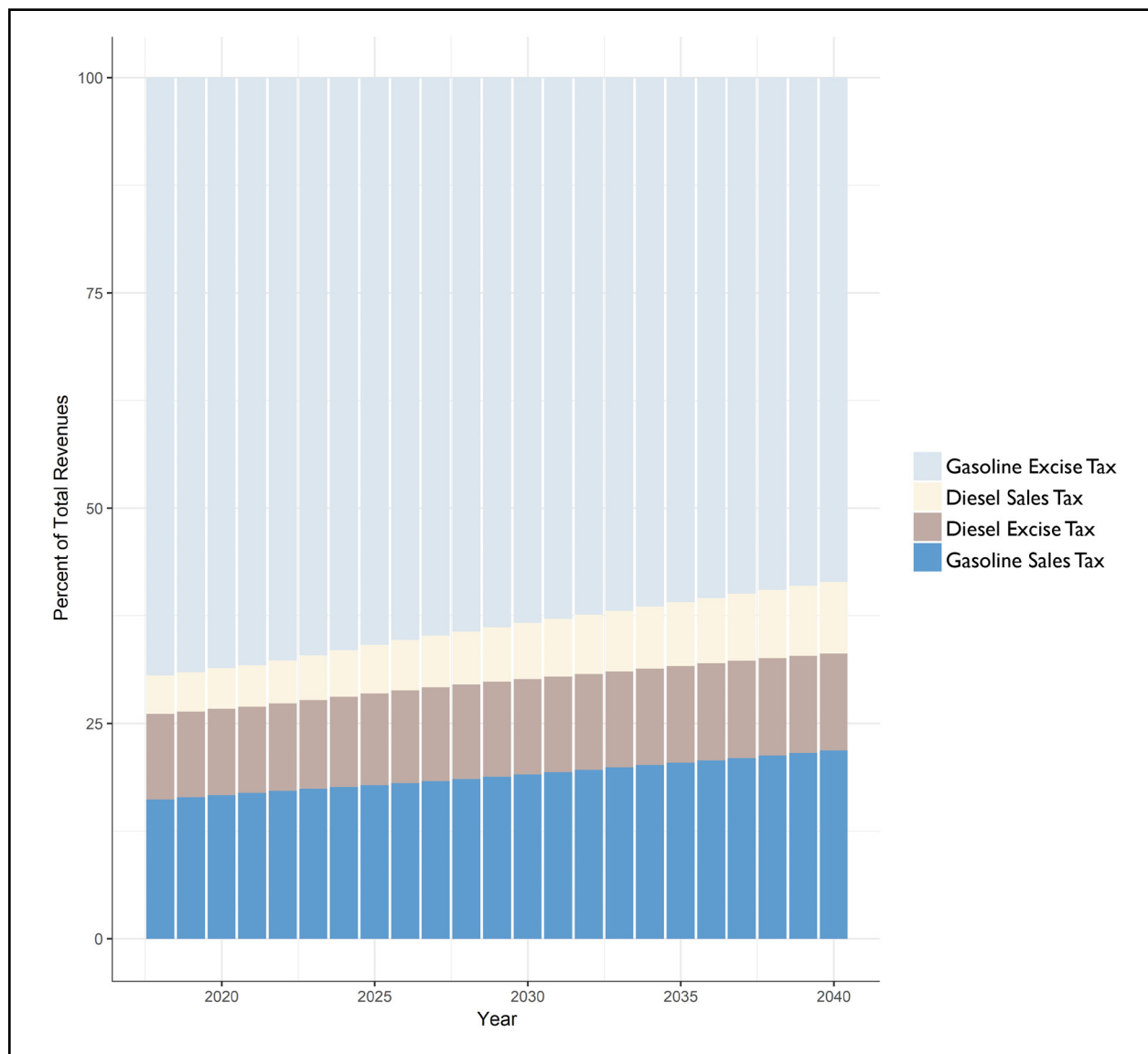


Figure 11. Percent of Revenue by Source Under SB1 Repeal, 2018–2040

Revenue per Registered Vehicle and per VMT

Using projections of expected changes in the state's vehicle fleet and volume of travel, the foregoing projections may be expressed as rates per registered vehicle or per vehicle mile of travel. After reviewing different growth rates based on differing assumptions, our projections assume that a net annual increase in registered vehicles in California of approximately 640,000.

Revenue per registered vehicle is presented in Figure 12. Under SB1, mean projected revenue will increase from \$264 per registered vehicle in 2018 to a maximum of \$310 per registered vehicle in 2021. Revenue per vehicle will then decline as more fuel efficient vehicles enter the state's fleet, dropping to \$188 per vehicle by 2040. Should SB1 be repealed, the mean projected revenue per vehicle will drop from \$220 in 2018 to \$74 in 2040.

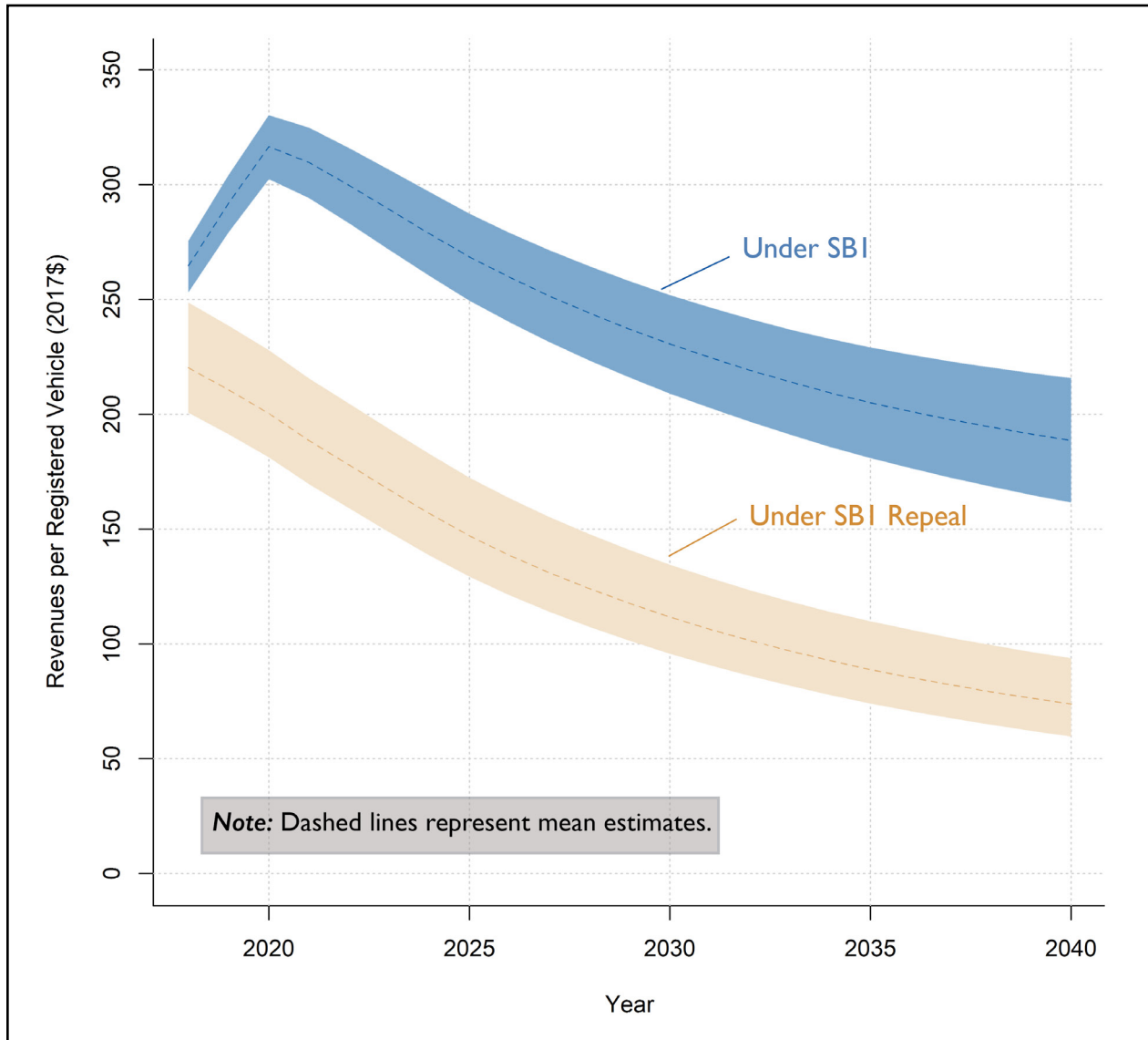


Figure 12. Projected Annual Transportation Revenue per Registered Vehicle, 2018–2040

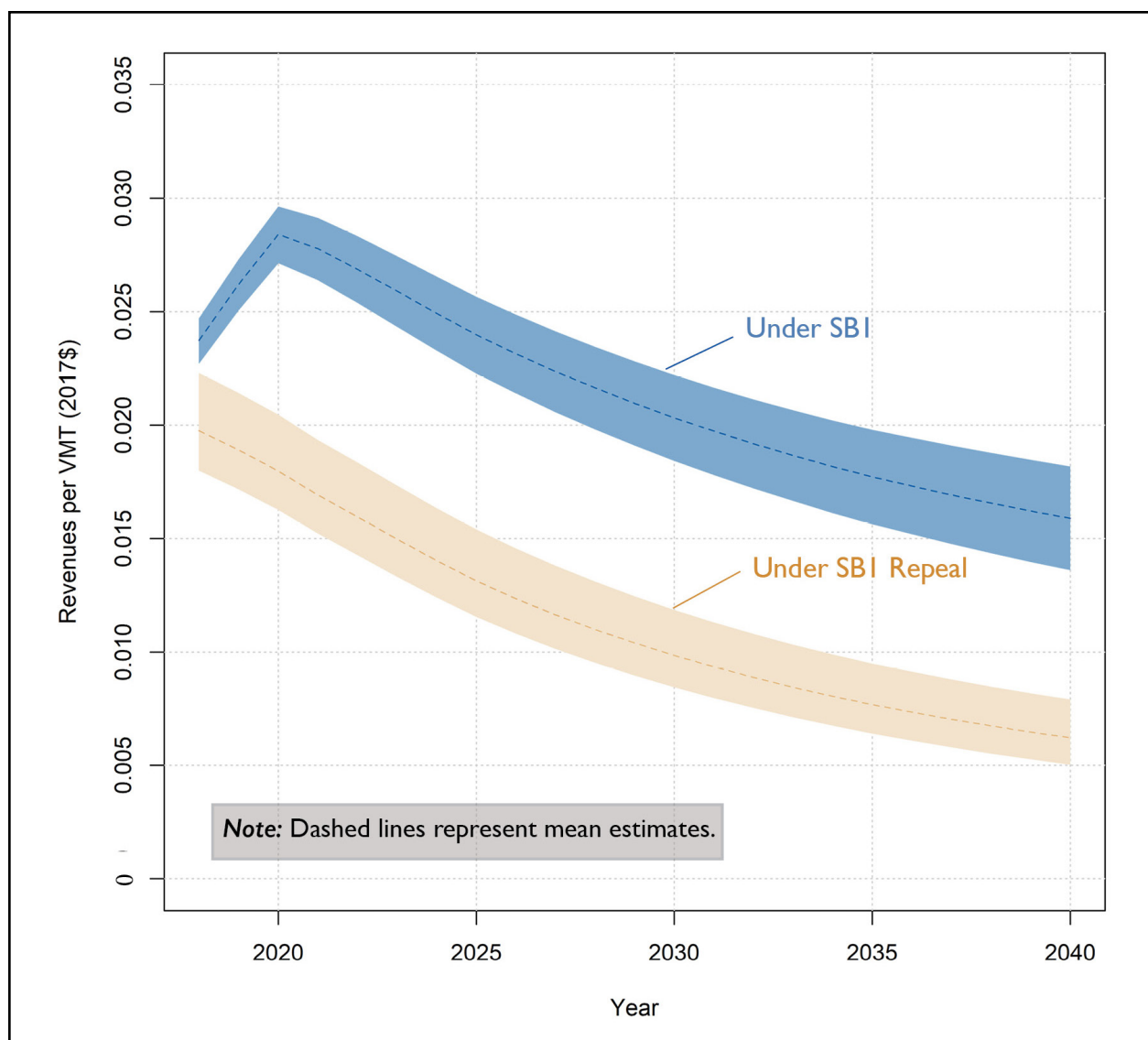


Figure 13. Projected Annual Transportation Revenue per VMT, 2018–2040

Revenue per VMT from the four taxes and fees associated with SB1 will change over time, as illustrated in Figure 13. Based on the last five years of complete data (2013 to 2017), the most likely VMT scenario is a moderate annual increase in VMT over the short term (~2%). With SB1 in place, the mean projected revenue will increase from around \$0.024 per VMT in 2018 to a maximum of \$0.028 per VMT in 2020 as additional SB1 provisions come into effect. After 2020, revenues per VMT will decline. By 2040, mean revenue per VMT is projected to be \$0.016 per VMT. If SB1 were to be repealed, however, mean revenue per VMT is projected to be \$0.006 per mile.

DISCUSSION AND CONCLUSIONS

Our projections indicate that transportation revenues under SB 1 will likely increase through 2040 even after correcting for inflation, but that the projected totals will not “solve” the transportation revenue problems of the state. In all likelihood additional financial strategies will be needed to ensure the financial security of California’s transportation programs.

The most likely trend related to revenue generated by SB1 is the apparent future decline over time in the relative productivity of gasoline excise taxes as fuel efficiency improves and electric vehicles become an increasing proportion of the state’s fleet. Revenue futures will also be sensitive to changes in future VMT levels, which are difficult to project. The decline of gasoline excise taxes as a percentage of total revenues and the sensitivity of revenues to VMT levels highlight the need for funding instruments, such as direct road use charges that are linked to road use rather than energy use. The repeal of SB1 would of course make alternative funding strategies far more urgent.

IV. PUBLIC OPINION ABOUT STATE TRANSPORTATION REVENUE OPTIONS

In the previous chapter we projected future revenue trends assuming either continuation of the structure and rates of taxes and fees provided for by SB1 or reversion to the revenue policy prior to SB1's passage. As the potential SB1 repeal illustrates, it would be shortsighted to assume that the state's tax and fee policy will remain unchanged indefinitely. And when at some point policymakers seek to make structural changes, obtaining political consensus will almost certainly be the key sticking point; raising additional revenues or switching to new types of user fees will be possible only when a majority of voters and elected officials support the changes.

To shed light on the political feasibility of possible changes to California's transportation taxes and fees, this final chapter reflects on available evidence about whether and when the public might support raising additional transportation revenues. Public sentiment is critical for both direct and indirect reasons. Most directly, more and more tax proposals in California have become subject to referenda; majority or supermajority support from the electorate makes or breaks a proposal. And indirectly, elected leaders are unlikely to support higher fees unless their constituents do.

For the past decade or more, conventional wisdom has held that there is little to debate: the public is flatly opposed to raising gas tax rates or to adopting a mileage fee to replace the gas tax. The high-profile movement to repeal SB1 might certainly support this simple view. However, a look past conventional wisdom to examine the evidence suggests a much more nuanced picture. This section presents evidence about public sentiment toward transportation taxes and fees, with a focus on gasoline taxes and a mileage tax. We first review the outcomes of votes by both legislators and the electorate, and then turn to findings from opinion research about raising new revenues from raising gas tax rates, adopting a new mileage fee, or raising vehicle registration fee rates. The chapter concludes with policy implications suggested by the evidence on public opinion.

Evidence about public opinion must be considered in light of the fact that most Americans have no idea what gasoline tax rates they pay, let alone how much those taxes actually cost them. While evidence about what they know is limited, studies suggest that many people overestimate how much they pay. For example, a review of focus group studies about mileage fees, conducted around the US, found that participants believed they paid more in gas taxes than they actually do, and did not know the actual per-gallon state or federal tax rates they paid.²⁹ It is possible that public opinion toward transportation taxes might change if people become more informed about the existing transportation tax and fees they pay.

EVIDENCE FROM VOTING OUTCOMES

Before turning to public opinion research, it is instructive to look at voting behavior with respect to transportation taxes and fees—votes by elected representatives and votes by the electorate. Three key trends in voting results from recent years demonstrate that at least some transportation tax increases have majority support: (i) legislators have voted

to raise gas taxes in many states; (ii) the electorate has reelected virtually all of these legislators (with a few notable exceptions, including the recent recall of California State Senator Josh Newman); and (iii) the electorate has directly enacted numerous ballot measures raising transportation taxes.

Looking to the state house, legislators in 26 states and the District of Columbia have voted since 2013 to change gas tax rates. Most of these actions will directly raise rates, though in a few places variable rate structures mean that rates will not necessarily rise in future.³⁰ Legislators in many of these states have also raised other transportation-related taxes and fees, such as vehicle registration fee rates.

Like legislators, the electorate has also proven willing to support higher transportation taxes both indirectly and directly. Evidence of indirect support comes from the fact that voters have not punished legislators for voting in favor of gas tax increases, with the one notable exception of California Senator Josh Newman. An analysis by the American Road and Transportation Builders Association (ARTBA) found that more 98% of state legislators who voted to raise a state gas tax won their next primary race, and 91% were ultimately re-elected. These rates were virtually the same as the rates for legislators who voted against gas tax increases.³¹

The electorate has also voted directly to raise different transportation taxes and fees, most notably at the local level. For example, in 2017, the American Public Transportation Association found that voters passed 88% of transit-related ballot initiatives in the US.³²

As noted earlier, California voters have been strong supporters of local-option sales taxes (LOSTs). Since 1976, California residents have voted on 76 LOSTs to fund transportation in 30 of the most populous of the state's 58 counties. As of 2017, 24 counties, home to 88% of the state's population, have active LOST measures. Since 1996, voters in these so-called "self-help counties" have approved the taxes by at least two-thirds majorities, as required by California law, and voters in some counties have approved LOST measures as many as five separate times.³³ Sales taxes are not the only transportation finance measures approved by voters. Regional Measure 3 in 2018 was approved by voters in the Bay Area. It provides for annual \$1 toll increases for three years on the Oakland–San Francisco Bay Bridge.³⁴

PUBLIC OPINION RESEARCH ABOUT FUEL TAXES

Public opinion about raising gasoline taxes previously was addressed in a synthesis of over a 100 public opinion surveys, each including at least one question on gasoline taxes. We also reviewed a series of eight annual polls that each asked many gas-tax questions and for which more nuanced analysis is available.

A 2017 report from the Mineta Transportation Institute provides analysis of findings from 136 US public opinion surveys that included at least one question asking whether respondents would support increasing gas tax rates.³⁵ The surveys, all released between 2005 and 2017, were conducted by government agencies, advocacy organizations, news outlets, and academic institutions. The specifics of the questions about gas taxes varied

greatly, making it difficult to systematically compare the results of one survey with the next. However, authors Agrawal and Nixon observed that while support levels were often low, a quarter of the surveys nevertheless found at least majority support.

Agrawal and Nixon have also run their own public opinion surveys from 2010 to 2017, each year asking 1,500 Americans about their support for raising additional federal revenue for transportation. The surveys, which used identical language each year for most questions, asked respondents about their support for seven different variations on a 10-cent increase in the federal gas tax rate. The results are presented in Figure 13. Survey administration details and detailed findings for each study can be found in the project reports.³⁶

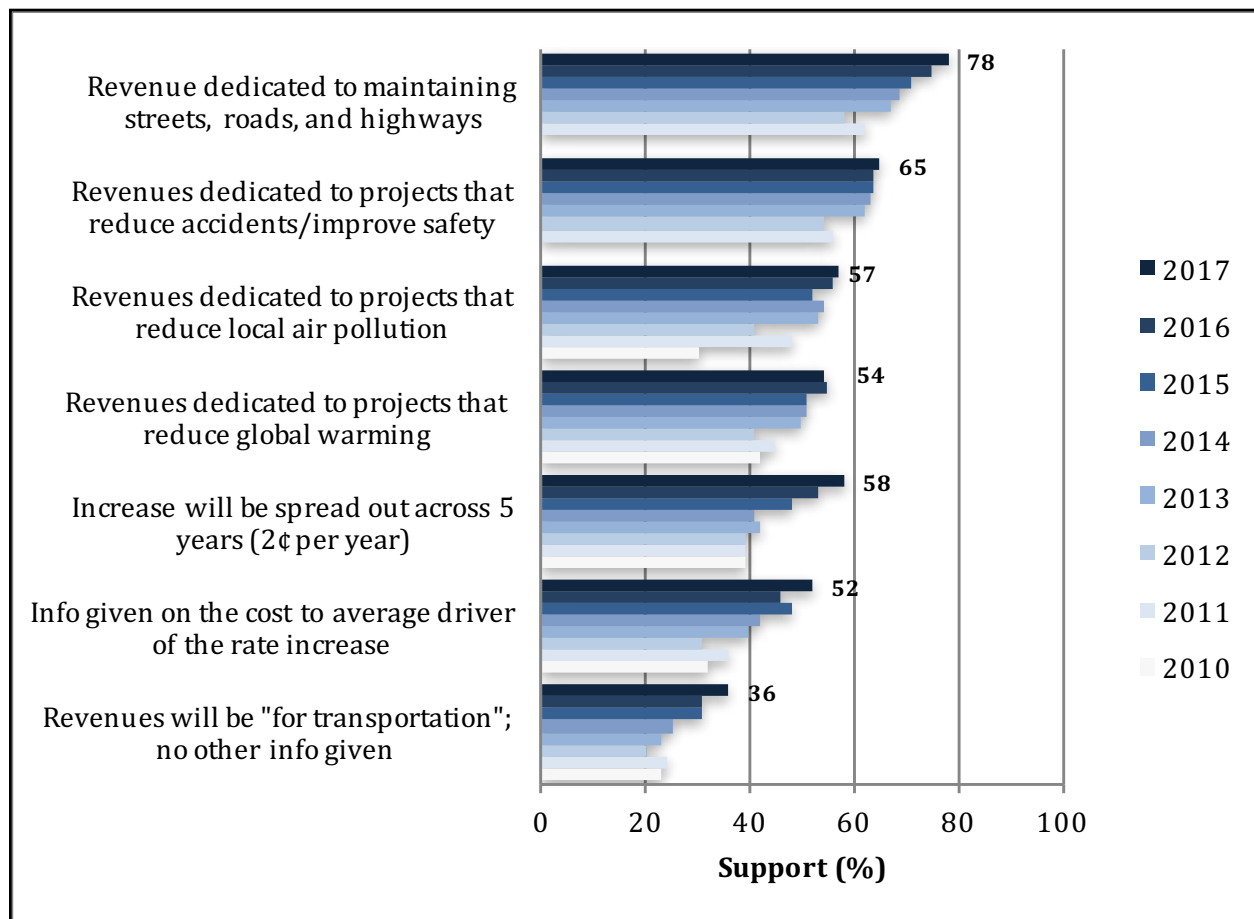


Figure 14. Support Among Americans for Seven Variations on a 10-cent Increase in the Federal Gasoline Tax Rate, 2010–2017

Source: Data from Asha Weinstein Agrawal and Hilary Nixon, What Do Americans Think about Federal Tax Options to Support Public Transit, Highways, and Local Streets and Roads? Results from Year Eight of a National Survey (Mineta Transportation Institute, San Jose, 2017).

Although the series of surveys polled residents across the US, the broad patterns of findings should apply equally well to California. Key findings across the seven tax options and eight surveys are that:

- One cannot conclude that Americans uniformly oppose gasoline tax increases. While some tax options surveyed had far less than majority support, others had strong majority support. Indeed, in 2017 support was above 50% for all options except the one described in the least detail (respondents only knew that the revenues would be spent “for transportation”).
- Tax structure and purpose matter a great deal to the public: for any single year, support varied substantially across the tax options. For example, in 2017, 78% of respondents supported a gasoline tax increase with revenues dedicated to maintaining streets, roads, and highways, but only 36% supported the same tax increase when they were told nothing more that the revenues would be spent “for transportation.” The spread between those two numbers is a striking 42 percentage points.
- Year after year, the most popular tax options tested in the survey have always been those that dedicated the revenue increase to projects to improve either safety or maintenance.
- There has been a modest but statistically significant increase in support for every tax option between 2010 and 2017.

In addition to looking for population-wide patterns, Agrawal and Nixon investigated support among different population subgroups. A few population subgroups consistently expressed higher support levels, including younger people, people who identified with any party *other* than the Republican Party, drivers of more fuel-efficient vehicles, and respondents who wanted to see government improve safety, expand transit, and/or improve maintenance. That said, the most popular maintenance and safety tax options had clear majority support from most subgroups.³⁷

PUBLIC OPINION RESEARCH ABOUT MILEAGE FEES

Compared to gas taxes, there are fewer public opinion surveys of mileage fees to review, but these collectively offer detailed findings. One source of information is the annual surveys by Agrawal and Nixon, which included two questions related to mileage taxes. Further, in 2016 Agrawal, Nixon and Hooper synthesized findings from public opinion surveys, focus groups, and media stories on mileage fees.³⁸ This report includes a qualitative analysis of the reasons that the public may support or oppose mileage fees. Third, extensive public opinion research was conducted as part of California’s Road User Charge Pilot Program.

Agrawal and Nixon’s annual series of polls asked respondents the extent of their support for two versions of a mileage fee: a flat-rate fee of a penny per mile, or a “green” mileage fee which would have drivers pay an average of a penny per mile with the exact rate depending on “how much the vehicle pollutes.” As shown in Figure 14, from 2010 to 2017 support for the flat-rate mileage fee remained low—around 22%—with very little variation. However, Figure 14 also shows that support for the green version rose over the years, from 33% in 2010 to 45% in 2017.³⁹

A look at support among different population subgroups shows findings similar to those for the gas tax variants. Support for both versions of the mileage tax was higher among younger people, people who identified with any party *other* than the Republican Party, drivers of more fuel-efficient vehicles, and respondents who wanted to see government improve safety, expand transit, and/or improve maintenance.

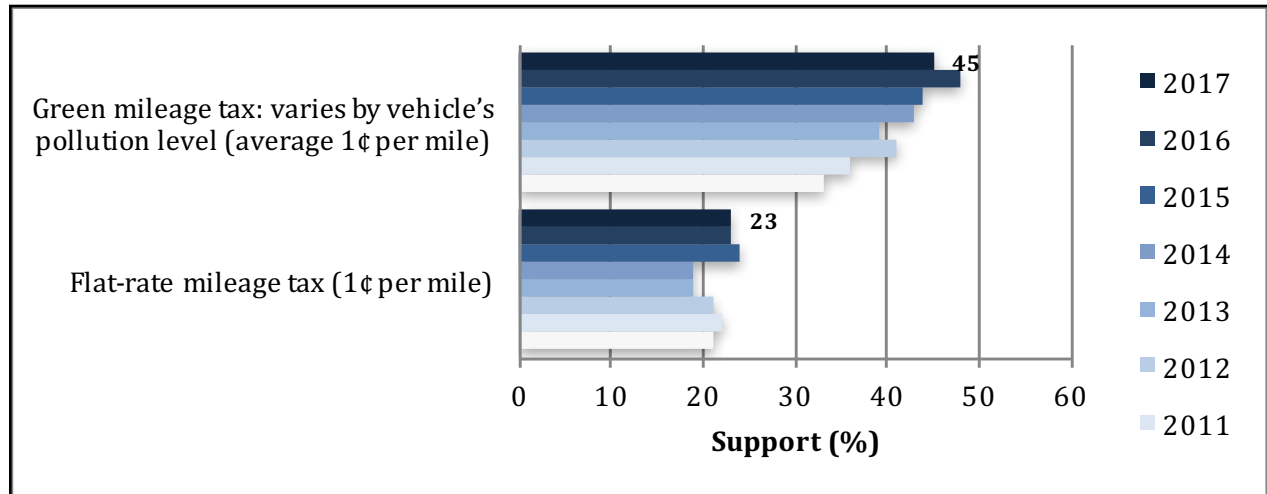


Figure 15. Support Among Americans for Two Versions of a Mileage Tax, 2010–2017

Source: Data from Asha Weinstein Agrawal and Hilary Nixon, *What Do Americans Think about Federal Tax Options to Support Public Transit, Highways, and Local Streets and Roads? Results from Year Eight of a National Survey* (Mineta Transportation Institute, San Jose, 2017).

The National Cooperative Highway Research Program (NCHRP) synthesis study on public opinion about mileage fees looked at 38 surveys that had asked questions about mileage fees. This study found results similar to Agrawal and Nixon's own survey series. Support varied a great deal from survey to survey, ranging from a low of 8% to a high of 50%, with support across the surveys hovering around a mean of 25%.⁴⁰ The NCHRP synthesis study also analyzed the *reasons* that Americans may support or oppose mileage fees, basing these conclusions largely on a review of 12 qualitative studies and 359 media stories. The primary reasons people opposed mileage fees were concerns that:

- 1. Mileage fees invade privacy.** Concern was highest for mileage fee systems that track time and location of travel, but people worried about privacy even with simple, odometer-based systems.
- 2. Mileage fees are unfair.** Fairness concerns took numerous forms. Some people felt it was unfair that a mileage fee would raise costs for people with fuel-efficient vehicles—those “doing their part for the environment”—as compared to fuel taxes. Others worried that drivers could unfairly avoid paying tolls, that out-of-area drivers would not get charged their fair share, and that the mileage fee system would be unfair to certain classes of drivers who might pay more than under the gas tax system.
- 3. Mileage fees will be inaccurately administered.** The technology tracking mileage will not perform accurately, and/or the administrative entity managing billing and collections will make mistakes and overbill.

- 4. Mileage fees remove an incentive to purchase fuel-efficient vehicles.** Moving from gas taxes to mileage fees is a step backwards, because government loses a policy tool that encourages people to buy fuel-efficient vehicles.
- 5. Lump-sum payments are hard on households.** Some drivers will have a hard time budgeting to make large, lump-sum mileage fee payments. By contrast, the gas tax is paid in frequent but small increments that do not require special budgeting.
- 6. Paying mileage fee bills is a hassle.** Mileage fees entail yet another account to keep up-to-date and another bill that has to be paid regularly, assuming that vehicle owners are charged through a billing system. Also, even the simplest mileage fee systems are complicated to understand.
- 7. Just raise the gas tax instead!** The gas tax still performs adequately and it avoids most disadvantages of a mileage fee. Therefore, it is better to raise gasoline tax rates than to implement a mileage fee.⁴¹

Despite the generally negative sentiments expressed about mileage fees, two types of positive comments that emerged from the qualitative analysis were that:

- 1. Mileage fees fairly charge all drivers.** Unlike the gas tax, mileage fees charge drivers of alternative-fuel and efficient vehicles for their road use.
- 2. Mileage fees could be a “solution” to the problems inherent in the gas tax.** Mileage fees can serve as a replacement for the gas tax once growing numbers of fuel-efficient and alternative fuel vehicles make the gas tax unworkable.⁴²

Agrawal, Nixon, and Hooper predicted that support for mileage fees could rise over time for two primary reasons. First, there has been a trend towards higher support in more recent surveys as compared to older ones. In addition, the social psychology literature suggests that as people hear about an idea repeatedly over time their acceptance grows. Evidence suggesting that this principle applies to mileage fees comes, for example, in a couple of pilot programs; support for such fees among participants was higher at the end of the pilots than in the beginning.

A final source of information about mileage fees in California was the polling and focus groups conducted as part of the state’s Road User Charge Pilot program. This nine-month pilot ran from 2016 to 2017, with more than 5,400 participants. An independent consultant conducted participant surveys at three points during the pilot, as well as running focus groups. Survey results show that satisfaction with the program rose over its course. Before the pilot began, 63% participants were somewhat or very satisfied, but by the end of the pilot the satisfaction rate rose to 85% of participants.⁴³ This 22 percentage point change in satisfaction rates from pre- to post-pilot is significant, reinforcing the finding from other research that familiarity with mileage fees increases support. (Interested readers will find more detailed study findings in the project report.)

PUBLIC OPINION RESEARCH ABOUT REGISTRATION FEES

Although no researchers of whom we are aware have conducted a meta-analysis of public opinion surveys on vehicle registration fee increases, MTI surveys of Californians from 2006 and 2009 explored support for registration fees. In both surveys, notably higher percentages of respondents supported a “green” version of a registration fee increase than supported a simpler version. In the “flat rate” version, the annual fee would rise from \$31 to \$62 a year. The green version would raise the rate to an average of \$62 per year for all vehicle owners, but vary the fee according to how much pollution the vehicle emits. The 2006 survey found that 32% supported increasing the vehicle registration fee from \$31 to \$62 per year, but 44% supported a “green” version of that fee where the average fee paid would be \$62. In the 2009 survey, 41% supported the flat-rate registration fee increase but 63% supported the green version.⁴⁴

IMPLICATIONS FOR POLICYMAKERS: DESIGNING TAXES THE PUBLIC WILL SUPPORT

The evidence is very clear that people’s opinions vary according to the characteristics of a proposed new transportation tax or fee increase—taxes are not all equal in the eyes of the electorate. While some taxes are definitely unpopular, others have earned majority or even supermajority support both on the ballot and in public opinion research.

The evidence suggests a variety of ways in which California policymakers can craft transportation tax and fee proposals that the electorate will support. Support levels will likely be higher under the following conditions:

- **People believe the revenue collected is being spent efficiently and on things they care about.** For example, the MTI surveys have consistently found that voters are particularly supportive of gas tax increases that will be spent on maintenance and safety improvements, as well as on taxes seen to benefit the environment. California voters also have approved a substantial proportion of LOST measures that require a supermajority of two-thirds, demonstrating that local taxes for projects that produce tangible local benefits can be quite popular.
- **People perceive that their out-of-pocket cost is low.** Perceived costs may be quite different from actual costs, given that many people do not know what they currently pay in transportation taxes and fees. There is also circumstantial evidence that people form their opinions based on the magnitude of the tax *rate* rather than by estimating their own out-of-pocket costs. For example, although local option sales taxes are charged on a very large base—purchases of many goods—people focus on the rate, which is usually quite a “small” number (a quarter-cent or half-cent). By contrast, a gas tax increase of ten cents per gallon may seem “more expensive” than a sales tax increase—ten sounds like a bigger number than one-half—even though a driver’s out-of-pocket cost difference is likely to be far lower under a per gallon fuel tax increases than under a much smaller percentage change in the sales tax rate.

- **The tax is easy to understand and convenient to pay.** Fuel taxes fit both criteria, given that the cost is wrapped up in the price of fuel and drivers do not have to make any separate tax payment. Also, fuel taxes do not require any effort to understand. (Indeed, many drivers are not conscious of paying them.) By contrast, many mileage fee program designs require drivers to manage an account and make regular payments. Finally, the evidence also suggests that public support for tax options crafted with the above principles in mind may increase over time. The social psychology literature predicts that familiarity breeds tolerance. This point is particularly important for mileage fees, a new concept for most. The public may become more tolerant of mileage fees once the concept is well understood. Evidence from mileage fee pilot programs bears this point out, as support among pilot participants invariably rises after the pilot is complete. Further, as more mileage fee pilots take place, the resulting publicity will raise public awareness of the concept.

V. CONCLUSION

The future of revenue for the state's transportation programs is uncertain, and the state's capacity to raise adequate funding for transportation is simultaneously fraught with frequent political disagreements and filled with opportunities provided by new and emerging technologies. After years of gradually declining user-fee revenue, deteriorating road conditions, growing traffic, and increasing reliance on local general fund financing, the state enacted a major increase in transportation funding through SB1. However, soon after SB1 was enacted, the law was challenged and put before voters on the November 2018 state ballot.

To illuminate public debate, this white paper projects transportation revenues through 2040, comparing the revenues that would flow into state coffers both with and without SB1. We constructed the estimates using a set of carefully chosen data sources and assumptions, relying on authoritative sources of data about likely future demographic, economic, and technological trends. The projections are presented as ranges because many of the assumptions used to make the projections are uncertain, and plausible variations can lead to different revenue values for any particular year.

We project that the annual difference in revenues with and without SB1 will be substantial. For 2020, the mean projection is that the state will collect \$10.4 billion with SB1 in place and \$6.6 billion without it, a difference of \$3.8 billion. Over time, changes in fuel economy and other factors will change annual revenue. By 2040, the mean projection is that the state will collect \$8.6 billion with SB1 and \$3.4 billion without it, a \$5.2 billion difference. These annual differences make a dramatic difference to the state, since transportation funding in California from all levels of government is presently estimated to total \$35 billion per year.

To help readers visualize what SB1 and its recall would cost California drivers, we also estimated the revenue that will be collected *per registered vehicle* under both scenarios. Under SB1, the mean projected cost to a vehicle owner will increase from \$264 per registered vehicle in 2018 to a maximum of \$310 per registered vehicle in 2021. Mean projected revenue per vehicle will then decline as more fuel efficient vehicles enter the state's fleet, dropping to \$188 per vehicle by 2040. Should SB1 be repealed, the mean projected revenue per vehicle will drop from \$220 in 2018 to \$74 in 2040.

The final section of the report synthesizes research about public attitudes toward alternative transportation taxes and fees. The literature reveals that the public is not unalterably opposed to increased taxes and fees for transportation, but that the acceptability of new imposts depends upon how they are structured and how the revenues that they produce will be used.

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Regardless of whether the State of California retains or repeals SB1, innovations in transportation technologies and changing travel preferences will require legislators to continually reflect on the most effective ways to collect the revenues needed to support a high-quality transportation system in California. We hope this short paper will inform the state's inquiries, debates, and actions in the coming years.

ENDNOTES

1. Mark Garrett, Anne Brown, and Martin Wachs, "Funding Transportation in California: A History of Crises," *California Journal of Politics and Policy* 8, no. 4 (2016).
2. California Legislative Analyst's Office, "Propositions on the November 6, 2018 Ballot: Proposition 6" (no date), <https://lao.ca.gov/BallotAnalysis/Proposition?number=6&year=2018> (accessed September 17, 2018).
3. California Legislative Analyst's Office, "Propositions on the November 6, 2018 Ballot: Proposition 6" (no date).
4. TRIP, *The Interstate Highway System Turns 60: Challenges to Its Ability to Continue to Save Lives, Time and Money* (Washington, D.C., TRIP, 2016).
5. Conference Committee on SB 4 and AB 3. 2015, "California's Transportation Funding Challenge," last modified October 21, <http://senate.ca.gov/content/transportation-and-infrastructure-development-1st-extraordinary-session>.
6. California Legislative Analyst's Office, *Overview of 2017 Transportation Funding Package*, <http://www.lao.ca.gov/Publications/Report/3688>; accessed October 3, 2019); John Lehrer, "California's Transportation Infrastructure: Roads to Ruin," *Westways*, June 2016.
7. California Legislative Analyst's Office, *Overview of 2017 Transportation Funding Package*.
8. Richard M. Zettel, *California Legislature: An Analysis of Taxation for Highway Purposes in California, 1895–1946* (California State Printing Office, 1946).
9. Garrett, Brown, and Wachs, 2016.
10. Ibid.
11. Ibid.
12. Zettel, 1946.
13. Garrett, Brown, and Wachs, 2016.
14. Chapter 105, *California Statutes of 1989*, https://clerk.assembly.ca.gov/sites/clerk.assembly.ca.gov/files/archive/Statutes/1989/89Vol1_Chapters.pdf (accessed September 30, 2018).
15. Garrett, Brown, and Wachs, 2016.
16. Garrett, Brown, and Wachs, 2016.

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17. Martin Wachs, “Chapter 9: Financing US Infrastructure: Choices for the 21st Century,” in Aman Khan and Klaus Becker, eds., *US Infrastructure: Challenges & Directions for the 21st Century*, forthcoming in 2019.
 18. Michael Sivak and Brandon Schoettle, “Monthly Variations in Car Sales Relative to Light-Truck Sales and in the Consequent Fuel Economy of All Vehicles Sold” (University of Michigan Sustainable Worldwide Transportation Report, October 2017).
 19. US Department of Transportation, National Highway Traffic Safety Administration, *Corporate Average Fuel Economy*, <https://www.nhtsa.gov/laws-regulations/corporate-average-fuel-economy> (accessed September 30, 2018).
 20. M. Albrecht, A. Brown, J. Lederman, B. D. Taylor, and M. Wachs, *The Equity Challenges and Outcomes of California County Transportation Sales Taxes* (UCLA Lewis Center and Institute of Transportation Studies, June 2017).
 21. Martin Wachs, “The Future of Transportation Finance: A New Generation of User Fees,” *Resources*, no. 175 (Summer 2010), pp. 11–12.
 22. Jennifer Dill, Todd Goldman, and Martin Wachs, “California Vehicle License Fees: Incidence and Equity,” *Journal of Transportation and Statistics* 2, no. 2 (1999). pp. 133–147.
 23. California Department of Transportation, *Evaluation of the California Road Charge Pilot Program* (prepared by CH2M, et al), November 2017.
 24. Federal Highway Administration, 2016.
 25. US Energy Information Administration, *Alternative Fuel Infrastructure Expansion: Costs, Resources, Production Capacity, and Retail Availability for Low-Carbon Scenarios*, <https://www.nrel.gov/docs/fy13osti/55640.pdf> (accessed September 30, 2018).
 26. US Energy Information Administration, *Assumptions to AEO2018*, <https://www.eia.gov/outlooks/aeo/assumptions> (accessed September 30, 2018).
 27. Anne Brown, Mark Garrett, and Martin Wachs, “Assessing the California Fuel Tax Swap of 2010,” *Transportation Research Record: The Journal of the Transportation Research Board*, no. 2670 (2017), pp. 16–23.
 28. Following the projections published in the Legislative Analyst’s Office’s *Overview of the 2017 Transportation Funding Package*, we assume Transportation Improvement Fee revenues will start at \$1.7 billion in 2018 and remain flat over time. We also assume that by 2040 the annual revenues may vary by \$425 million more or less than \$1.7 billion.

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29. Asha Weinstein Agrawal, Hilary Nixon, and Ashley M. Hooper, *Public Perception of Mileage-Based User Fees*, National Cooperative Highway Research Program Synthesis 487 (Washington, D.C., Transportation Research Board, 2016), p. 17.
 30. National Conference of State Legislatures, “Recent Legislative Actions Likely to Change Gas Taxes,” February 20, 2018, <http://www.ncsl.org/research/transportation/2013-and-2014-legislative-actions-likely-to-change-gas-taxes.aspx> (accessed May 21, 2018).
 31. American Road and Transportation Builders Association, “Analysis Shows Voting for a State Gas Tax Increase Does Not Hurt Reelection Chances” (2017), http://transportationinvestment.org/wp-content/uploads/2017/04/ARTBA-TIAC-2013_2016-Legislator-Reelection-Analysis.pdf (accessed May 21, 2018).
 32. American Public Transportation Association, “Nearly 90% of Transit Ballot Initiatives Pass in 2017” (November 8, 2017), <http://www.apta.com/mediacenter/pressreleases/2017/Pages/2017-Ballot-Initiatives.aspx> (accessed May 21, 2018).
 33. Maxwell Albrecht, Anne Brown, Jaimee Lederman, Brian D. Taylor, and Martin Wachs, *The Equity Challenges and Outcomes of California County Transportation Sales Taxes* (UCLA Lewis Center and Institute of Transportation Studies, June 2017), <http://www.its.ucla.edu/publication/equity-challenges-outcomes-california-county-transportation-sales-taxes/> (accessed July 25, 2018).
 34. Metropolitan Transportation Commission, *Advocate and Lead, Regional Measure 3*. <https://mtc.ca.gov/our-work/advocate-lead/regional-measure-3> (accessed September 30, 2018).
 35. Asha Weinstein Agrawal and Hilary Nixon, *What Do Americans Think about Federal Tax Options to Support Public Transit, Highways, and Local Streets and Roads? Results from Year Eight of a National Survey* (Mineta Transportation Institute, San Jose, 2017).
 36. See the report, and sources cited therein: Agrawal and Nixon, 2017.
 37. Hilary Nixon and Asha Weinstein Agrawal, “Would Americans Pay More in Taxes for Better Transportation? Answers from Seven Years of National Survey Data,” *Transportation* (2018), pp. 1-24.
 38. Agrawal, Nixon, and Hooper, 2016.
 39. Agrawal and Nixon 2018.
 40. Agrawal, Nixon, and Hooper, 2016.
 41. Ibid.

42. Ibid.
43. California Department of Transportation, *Evaluation of the California Road Charge Pilot Program* (prepared by CH2M, et al), November 2017.
44. Asha Weinstein Agrawal, Jennifer Dill, and Hilary Nixon, “Green” *Transportation Taxes and Fees: A Survey of Californians* (San Jose: Mineta Transportation Institute, San José State University, June 2009).

BIBLIOGRAPHY

- Agrawal, Asha Weinstein, et al, *Transportation Financing Opportunities for the State of California*. San Jose: Mineta Transportation Institute, October 2006.
- Agrawal, Asha Weinstein, Jennifer Dill, and Hilary Nixon. “Green” *Transportation Taxes and Fees: A Survey of Californians*. San Jose: Mineta Transportation Institute, San José State University, June 2009.
- Agrawal, Asha Weinstein, and Hilary Nixon. *What Do Americans Think about Federal Tax Options to Support Public Transit, Highways, and Local Streets and Roads? Results from Year Eight of a National Survey* Mineta Transportation Institute, San Jose, 2017.
- Agrawal, Asha Weinstein, Hilary Nixon, and Ashley Hooper. *Public Perception of Mileage-Based User Fees*, National Cooperative Highway Research Program Synthesis 487. Washington, D.C., Transportation Research Board, 2016.
- Albrecht, M., A. Brown, J. Lederman, B. D. Taylor, and M. Wachs. *The Equity Challenges and Outcomes of California County Transportation Sales Taxes*. UCLA Lewis Center and Institute of Transportation Studies, June 2017.
- American Public Transportation Association. “Nearly 90% of Transit Ballot Initiatives Pass in 2017.” November 8, 2017. <http://www.apta.com/mediacenter/pressreleases/2017/Pages/2017-Ballot-Initiatives.aspx> (accessed May 21, 2018).
- American Road and Transportation Builders Association. “Analysis Shows Voting for a State Gas Tax Increase Does Not Hurt Reelection Chances.” 2017. http://transportationinvestment.org/wp-content/uploads/2017/04/ARTBA-TIAC-2013_2016-Legislator-Reelection-Analysis.pdf (accessed May 21, 2018).
- Brown, Anne, Mark Garrett, and Martin Wachs. “Assessing the California Fuel Tax Swap of 2010,” *Transportation Research Record: The Journal of the Transportation Research Board*, no. 2670 (2017), pp. 16–23.
- California Department of Transportation. *Evaluation of the California Road Charge Pilot Program* (prepared by CH2M, et al). November 2017.
- California Legislative Analyst’s Office. *Overview of 2017 Transportation Funding Package*. <http://www.lao.ca.gov/Publications/Report/3688> (accessed September 17, 2018).
- _____. “Propositions on the November 6, 2018 Ballot: Proposition 6” (no date), <https://lao.ca.gov/BallotAnalysis/Proposition?number=6&year=2018> (accessed September 17, 2018).

- Conference Committee on SB 4 and AB 3. 2015. "California's Transportation Funding Challenge." Last modified October 21. <http://senate.ca.gov/content/transportation-and-infrastructure-development-1st-extraordinary-session>. (accessed September 17, 2018).
- Dill, Jennifer, Todd Goldman, and Martin Wachs. "California Vehicle License Fees: Incidence and Equity," *Journal of Transportation and Statistics* 2, no. 2 (1999), pp. 133–147.
- Garrett, Mark, Anne Brown, and Martin Wachs 2016. "Funding Transportation in California: A History of Crises," *California Journal of Politics and Policy* 8, no. 4.
- Lehrer, John. 2016. "California's Transportation Infrastructure: Roads to Ruin," *Westways*, June. www.calif.aaa.com/home/publications/westways/car-tips/2016-california-transportation-infrastructure.html. (accessed July 28, 2016).
- National Conference of State Legislatures, "Recent Legislative Actions Likely to Change Gas Taxes," February 20, 2018, <http://www.ncsl.org/research/transportation/2013-and-2014-legislative-actions-likely-to-change-gas-taxes.aspx>. (accessed May 21, 2018).
- Nixon, Hilary, and Asha Weinstein Agrawal. "Would Americans Pay More in Taxes for Better Transportation? Answers from Seven Years of National Survey Data." *Transportation* (2018), pp. 1–22.
- Sivak, Michael, and Brandon Schoettle. "Monthly Variations in Car Sales Relative to Light-Truck Sales and in the Consequent Fuel Economy of All Vehicles Sold." University of Michigan Sustainable Worldwide Transportation Report, October 2017.
- TRIP. *The Interstate Highway System turns 60: Challenges to Its Ability to Continue to Save Lives, Time and Money*. Washington, D.C.: TRIP, 2016. www.tripnet.org/docs/Interstate_Highway_System_TRIP_Report_June_2016.pdf. (accessed September 30, 2018).
- Wachs, Martin. 2010. "The Future of Transportation Finance: A New Generation of User Fees," in *Resources*, no. 175 (Summer), pp. 11–12.
- Wachs, Martin. 2017. "Financing US Infrastructure: Choices for the 21st Century." Paper presented at the conference "US Infrastructure: Challenges & Directions for the 21st Century," Texas Technical University, September 8 & 9, 2017. Forthcoming in the conference proceedings.
- Weinstein, Asha, et al. *Transportation Financing Opportunities for the State of California*. San Jose: Mineta Transportation Institute, San José State University, October 2006.
- Zettel, Richard M. *California Legislature: An Analysis of Taxation for Highway Purposes in California, 1895–1946*. California State Printing Office, 1946.

APPENDIX: METHODOLOGICAL DETAILS

This appendix describes the formulas, data sources, and assumptions used to construct the revenue forecasts. More details are available in supplemental materials found at transweb.sjsu.edu/research/1850.

This appendix is divided into three sections. The first presents the formulas and assumptions used to project revenues under SB1 from 2018 to 2040, the next presents the formulas and assumptions used to project revenues from 2018 to 2040 should SB1 be repealed, and the third presents the variables and data sources used in the forecasting models.

FORMULAS USED TO PREDICT REVENUE UNDER SB1

Gasoline Excise Tax Revenues

Projected gasoline excise tax revenues in year x =
gallons of gasoline sold in year x * CPI-adjusted gasoline excise tax rate in year x

Diesel Excise Tax Revenues

Diesel excise revenues in year x =
(gallons of diesel sold * CPI-adjusted diesel sales tax rate) + IFTA Component B revenues

Diesel Sales Tax Revenues

Diesel sales tax revenues in year x =
gallons of diesel sold * sales tax rate

Road Improvement Fee Revenues (from Zero Emission Vehicles)

Road improvement fee revenues in year x =
Number of registered ZEVs in year x * CPI-adjusted road improvement fee in year x

Transportation Improvement Fee Revenues

Transportation improvement fee revenues in year x =
\$1.7 billion + (\$19,318,181.82 * y), where y = number of years since 2018

FORMULAS USED TO PREDICT REVENUE IF SB1 IS REPEALED

The projections assume that if SB1 is repealed, the state will revert to the tax rates in effect under the so-called “Gasoline Tax Swap Rule” and the sales-based excise tax on gasoline will be in effect.

Gasoline Excise Tax Revenues

Gasoline excise tax revenues in year x =
gallons of gasoline sold * gasoline excise tax rate

Gasoline Sales Tax Revenues

Gasoline sales tax revenues in year x =
gallons of gasoline sold * sales tax rate

Diesel Excise Tax Revenues

Diesel excise revenues in year x =
(gallons of diesel sold * diesel sales tax rate) + IFTA Component B revenues

Diesel Sales Tax Revenues

Diesel sales tax revenues in year x =
gallons of diesel sold * sales tax rate

VARIABLES AND SOURCES OF DATA USED IN THE FORECASTS

The following table presents the variables used as inputs for the forecasts, showing for each variable the data source as well as explanatory notes about assumptions made.

Variable	Source	Assumptions
Tax and fee rates		
Rates under SB1 for the gasoline excise tax, diesel excise tax, diesel sales tax, and Road Improvement Fee level.	California Legislative Information SB1 Transportation Funding Bill Text	We assume that the gasoline excise tax rate, diesel excise tax rate, and the Road Improvement Fee will all be adjusted for inflation using the California Consumer Price Index, following the methodology specified in SB1.
Gasoline excise tax rate under SB1 repeal	California Department of Tax and Fee Administration Motor Fuel (Gasoline) Rates by Period (2010–2017)	We assume the gasoline excise tax rate will remain at \$0.34 per gallon, which was the mean annual change from 2010 to 2017. The gasoline excise tax rate both increased and decreased during the period from 2010 to 2017, so we found it inappropriate to project change in the gasoline excise tax rate moving forward.
Gasoline sales tax rate under SB1 repeal	California Department of Tax and Fee Administration Motor Fuel (Gasoline) Rates by Period (2010–2017)	We assume the gasoline sales tax rate under SB1 repeal will remain at 2.25%, which was the historical constant rate from 2010 to 2017.
Economic indicator variables		
California Consumer Price Index	State of California Department of Industrial Relations California Consumer Price Index (1999–2017)	We assume the CA Consumer Price Index (CPI) will continue to increase by 2.51% annually. This rate is the mean annual change in the CA CPI from 1999 to 2017.
Inflation rate	Bureau of Labor Statistics Consumer Price Index (2000–2017)	We assume inflation continues at 2.17% per year, which was the mean annual change from 2000 to 2017.
Motor fuel-related variables		
Gallons of gasoline sold in the United States (2018–2040)	United States Energy Information Administration Annual Outlook 2018 (Region: United States)	We used the mean of the EIA's 24 gasoline sales projection scenarios (+/- 1 standard deviation) to bound our projections of future gasoline sales from 2018–2040.
California's share of total national gasoline sales	United States Energy Information Administration State Energy Consumption Estimates 1960–2016	We assume that California's share of national total of gasoline gallons sold will continue to decrease by 2.40% annually, which is the mean change per year in California's share of the national total of gasoline sold from 2000 to 2016.
Gasoline price	California Energy Commission California Average Weekly Retail Gasoline Prices (2012–2018)	We assume that gasoline prices at the beginning of the projection period will start at the 2012–2018 average (+/- 1 standard deviation) and increase with inflation.
Gallons of diesel sold in the United States (2018–2040)	United States Energy Information Administration Annual Outlook 2018 (Region: United States)	We used the mean of the EIA's 24 gasoline sales projection scenarios (+/- 1 standard deviation) to bound our projections of future diesel sales from 2018–2040.
California's share of total national diesel sales	United States Energy Information Administration State Energy Consumption Estimates 1960 through 2016	We assume that California's share of national total of diesel gallons sold will continue to decrease by 0.57% annually, which is the mean change in California's share of the national total of gasoline sold from 2000 to 2016.

Variable	Source	Assumptions
Gallons of diesel covered under the International Fuel Tax Agreement (IFTA)	California Board of Equalization Taxes and Fees (Annual Summaries 2006–2016); California Board of Equalization IFTA Tax Rates (2006–2016)	We were unable to directly obtain records of the amount of gallons of diesel covered under IFTA historically in California. We estimated gallons of diesel covered under IFTA using IFTA tax revenue receipts and IFTA tax rates.
IFTA Component B tax rate	California Board of Equalization IFTA Tax Rates (2010–2017)	We assume the IFTA Component B rate remains at \$0.27 per gallon, which is the mean rate from 2010 to 2017. The IFTA Component B rate both increased and decreased during the period from 2010 to 2017, so we found it inappropriate to project change in the IFTA Component B tax rate moving forward.
Diesel prices	United States Energy Information Commission Gasoline and Diesel Fuel Prices (2012–2018)	We assume that diesel prices will increase with inflation.
Vehicle-related variables		
Registered vehicles in California	California Department of Motor Vehicles Forecasting Unit Vehicle Registrations (2012–2017) (Personal communication)	We assume vehicle registrations in California will continue to increase annually by 639,445, which is the mean annual change in the number of vehicle registrations in California from 2012 to 2017.
Zero-Emission Vehicles (ZEVs) in California	California Department of Motor Vehicles Vehicle Registrations by Type (2012–2017) (Personal communication)	We assume ZEVs in California will increase by 26,636 (+/-1 standard deviation) annually, which is the mean increase in ZEVs in California from 2012 to 2017.
Vehicle miles traveled (VMT) in California	Federal Highway Administration Traffic Volume Trends (2007–2017)	We assume VMT in California will continue to increase by 2% annually, which is the mean change from 2007 to 2017.

ABBREVIATIONS AND ACRONYMS

CPI	Consumer Price Index
EIA	Energy Information Administration
FAST Act	Fixing America's Surface Transportation Act, 2015
GO	General Obligation
LOST	Local-Option Sales Tax
IFTA	International Fuel Tax Agreement
OBD	On-Board Diagnostics
RUC	Road-Use Charge
SB1	Senate Bill 1
VMT	Vehicle Miles Traveled
ZEV	Zero-Emission Vehicle

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