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I. Introduction

The COVID-19 pandemic and the associated policy responses have had a significant impact on government budgets. Federal spending has skyrocketed. State and local governments, almost all of which face some form of annual balanced budget rule, confront fiscal shocks on both the revenue and spending sides that threaten to make the recession deeper and slow the recovery. This paper examines the impact of COVID on the fiscal status of the federal government and the states.[2]

Section II provides new projections of the federal budget outlook, with five main results. First, we document that the pandemic and the policy responses to it rapidly and substantially raised federal deficits, but only on a temporary basis. Spending and revenue are projected to return to pre-COVID baseline values relatively quickly.

Second, the long-term fiscal outlook through 2050 has deteriorated somewhat. Under the

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[2] Other countries are facing similar fiscal issues. The International Monetary Fund (2020) estimated that, as of July, the effects of COVID-related automatic and discretionary policy changes have increased cumulative deficits by 13.6 percent of GDP in advanced countries.

Congressional Budget Office's (CBO 2020f) assumptions for GDP growth and interest rates, we project that the debt-to-GDP ratio, currently 98 percent, will rise to 190 percent in 2050 under current law, compared to a pre-COVID baseline projection of 180 percent. CBO (2020f) obtains a similar projection – 195 percent – using a slightly different set of assumptions.

Third, although the economic downturn and COVID-related legislation raise debt permanently, sharply lower projections of interest rates for the next dozen years help moderate future debt accumulation. Nevertheless, even during the period when interest rates are projected to be low, the projected debt-to-GDP ratio rises steadily due to substantial and rising primary deficits, driven largely by rising outlays on health-related programs and Social Security. As the economy grows and debt accumulates, interest rates are projected to rise and to exceed the nominal GDP growth rate by increasing amounts starting in the early 2040s.

Fourth, under a "current policy" projection that allows temporary tax provisions – such as those in the Tax Cut and Jobs Act of 2017 – to be made permanent, the debt-to-GDP ratio would rise to 222 percent by 2050 and would continuing rising thereafter. Fifth, the long-term projections are sensitive to interest rates. If interest rates remain low (that is, at their projected level for 2025), rather than rising as in the CBO projections, the debt-to-GDP ratio would equal 157 percent in 2050 under current policy.

We discuss several aspects of these results – including how the current episode compares to past debt changes, the role of historically low interest rates, and recent Federal Reserve Board policies. Because of the macro-stabilization effects of fiscal tightening, and because low interest rates create "breathing room" for fiscal policy,[3] we do not see the large, short-run debt accumulation resulting from the current pandemic as necessitating any immediate offsetting

[3] Elmendorf and Sheiner (2017), Blanchard (2019a, 2019b)

response. But the long-term projections show that significant fiscal imbalances remain and will eventually require attention.

Section III discuss the effects on state and local governments. We examine several recent estimates of the effects of the pandemic on state and local budgets—some of which find relatively modest effects and others which find effects that dwarf those experienced during the Great Recession. We note that the very unusual nature of the current recession means that relying on the historical relationships between the state of the economy and state and local tax revenues may produce misleading results. We instead attempt to calculate the impact on state and local government using a "bottom-up" approach that accounts for the geographic variation in the distribution of unemployment and consumption declines, the fact that low-wage workers have been particularly hard hit this recession while higher-income workers have been much less affected, and the fact that the stock market has not responded to the economic downturn as it has in the past.

Our findings suggest that this pandemic is indeed having very unusual effects on state and local revenues. We estimate far smaller income tax losses than would have been expected on the basis of historical experience, which we attribute to the fact that employment losses have been unusually concentrated on low-wage workers, the unprecedented increases and expansions of unemployment insurance benefits and business loans, which will shore up taxable income in 2020, and the fact that the stock market has held up so far, unlike most of the prior economic downturns. On the other hand, our estimates of the losses in sales and other taxes and fees are much larger than one would have expected—the decline in use of transportation services alone seems likely to depress revenues by over $45 billion this year. In aggregate, we estimate that state and local own source revenues, excluding fees to public hospitals and institution of higher

education—which we view as somewhat distinct— will decline $155 billion in 2020, $167 billion in 2021, and $145 billion in 2022. Including lower fees to hospitals and higher ed would bring these totals to $188 billion, $189 billion, and $167 billion.

We then turn to a discussion of federal aid. We estimate that the legislation enacted last spring provides about $212 billion in aid to state and local governments, excluding aid to public hospitals and higher ed, and $250 billion including that aid. *While this appears to be larger than the total revenue declines expected this year, that doesn't mean that the aid has been sufficient to preclude tough budget choices and poor macroeconomic outcomes.* First, should the economy remain below its pre-COVID baseline for many years, as the CBO projections suggest, these governments will face significant shortfalls in coming years. Knowing that, they are likely to restrain spending somewhat this year, and make additional cuts in coming years. Second, the pandemic itself has likely increased the demands on state and local governments—for public health spending, virtual schooling, help for the elderly, etc. Simply maintaining pre-COVID levels of spending may not be enough to assure that necessary services aren't cut. Finally, our analysis shows that smaller states got much more generous aid relative to their losses, and that states like New York and California will likely be facing budget shortfalls in the current year even without consideration of the spending demands brought on by COVID-19.

Section IV provides concluding remarks.

II. The Federal Budget Outlook

We examine the fiscal outlook over 10- and 30-year horizons. While the shorter horizon conforms to that used by CBO in its standard budget analysis, the longer horizon provides additional insight about underlying budget trends and questions of fiscal sustainability.

A. Constructing Budget Baselines

1. Ten-year outlook

To provide perspective on both the current budget outlook and how it was affected by the COVID pandemic, we examine three baselines. The "pre-COVID baseline" is based entirely on current law projections that the Congressional Budget Office (CBO, 2020a) made in January, pre-dating any consideration of the impact of COVID on the economy.

The "current law" baseline is embodied in the CBO's most recent 10-year budget projection (CBO 2020c). These projections – by law and convention – assume that Congress does (almost) nothing in the way of new programs or tax changes for the next 10 years.[4] Current law projections serve an important purpose – they show where the government is headed in the absence of almost any action. Another way to proceed, however, is to ask where the government is headed if policy makers continue to make choices like they have in the past. Constructing a baseline along these lines – typically characterized as "current policy" – clearly requires judgment calls to project the consequences of Congress following a "business as usual" approach.

Our current policy projections start with current law projections and make a series of adjustments (based on CBO data). These adjustments simply show the effects of what, in our judgment, can be viewed as a continuation of current policies. Given the wide array of provisions enacted in the last year due to the COVID pandemic, judgments about what constitutes current policy are particularly difficult under present circumstances, so we focus narrowly on items that

[4] But the projections do require that Congress increase or suspend the debt limit as needed to carry out the tax and spending programs in the baseline, that temporary entitlement programs (like SNAP and TANF) are reauthorized on schedule, and that outlays for discretionary spending programs remains constant in real terms over the decade, unless such authority is governed by a specific law. Also, current law projections assume that when the Social Security, Disability, and Medicare (part A) trust funds are exhausted, Congress will (a) authorize full payment of promised benefits and (b) cover any shortfalls with general revenue financed by federal borrowing.

are conventionally included in "current policy" estimates.

Specifically, we assume that, as it has done in the past, Congress makes temporary tax-cut provisions permanent, including the temporary provisions in the 2017 Tax Cuts and Jobs Act.[5] We allow real non-defense discretionary spending to rise with population growth, rather than remaining constant over time, as CBO assumes, because maintaining current services for these programs is likely to require a population adjustment.[6] We assume all CARES Act provisions are implemented and allowed to expire as scheduled and that the President's payroll tax deferral has no effect on any budget outcome.

B. 30-year outlook

Looking only at the next ten years gives an incomplete picture of the fiscal outlook, even with adjustments made to characterize current policy. Projections covering 30 years are generally sufficient to capture most long-term trends. To generate the longer-term projections, we begin with budget and economic figures for 2030 (in the three baselines developed above) and project forward each part of the government budget. Except where noted below, the three baselines are based on similar assumptions after 2030.

First, following CBO (2020f), the nominal growth rate of GDP is set equal to 3.6 percent for 2031-40 and 3.5 percent for 2041-2050. Second, for Medicare and Old-Age, Survivors, and Disability Insurance (OASDI), we project all elements of spending and dedicated revenues

[5] Examples of major expiring provisions in the 2017 tax act include "100 percent bonus depreciation" (expensing of business investment in qualifying equipment), the marginal individual rate cuts, the increased standard deduction, the repeal of personal exemptions, the increased estate tax exemption, the cap on state and local tax deductions, and the 20 percent deduction for certain pass-through income. Examples of expiring provisions outside of the 2017 tax act include tax credits for biodiesel and alternative fuel mixtures and the deduction for mortgage insurance premiums.

[6] In contrast, defense spending, which largely provides a non-rival public good, plausibly can maintain current services over the relatively short 10-year horizon without a population adjustment.

(payroll taxes, income taxes on benefits, premiums and contributions from states) using the growth rates as a share of GDP in the intermediate projections in the 2020 Trustees Reports for the period between 2030 and 2050. Third, for Medicaid and the Children's Health Insurance Program (CHIP), we use the most recent long-term CBO (2020f) projections. Fourth, all other non-interest spending—"other" mandatory spending and discretionary spending—is assumed to remain constant as a share of GDP. Fifth, income taxes other than those tied to Social Security and Medicare benefits grow with "bracket creep" according to CBO' most recent long-term projections. Sixth, all other revenues (corporate taxes, excise taxes, etc.) remain constant at their 2030 shares of GDP.

Seventh, "current law" and "current policy" average interest rates on the public debt follow the projections in the latest Long-Term Budget Outlook (CBO 2020f). To estimate net interest payments in years after 2030, we multiply the average interest rate in a given year by the sum of (a) half of the primary deficit in that year and (b) outstanding government debt at the end of the previous year.

In addition to projecting debt and deficits over the 30-year horizon, we also present estimates of the "fiscal gap," an accounting measure that is intended to reflect the long-term budgetary status of the government.[7] The fiscal gap answers the question: if one starts a policy change in a given year to reach a given fiscal target in a given future year, what is the size of the annual, constant-share-of-GDP increase in taxes or reductions in non-interest expenditures (or

[7] Auerbach (1994). Appendix 1 describes the construction of the fiscal gap and how interest rates affect it. Auerbach et al. (2003) discuss the relationship between the fiscal gap, generational accounting, accrual accounting, and other ways of accounting for government. Note that estimates of the fiscal gap do not in any way imply that level reductions as a share of GDP are the best way to achieve a given fiscal target, rather than, say, level reductions as a share of primary deficits (which in the present circumstance would imply a growing path of primary deficit reductions). The fiscal gap measure just provides one convenient way to think about the magnitude of a fiscal shortfall, given a future fiscal goal.

combination of the two) that would be required, holding projected economic performance unchanged? For example, one might ask what immediate and constant policy change would be needed to obtain some target debt-to-GDP in 2050.[8] Or, one might ask what constant share-of-GDP change would be required, starting with a delay, say in 2025, or to achieve a net interest-to-GDP ratio of 2 percent by 2050.

B. Projections

1. Economic Projections

Figure 1 shows how real GDP projections changed because of COVID. Relative to the pre-COVID baseline, projected real GDP falls significantly early in the decade and is not projected to regain the pre-COVID baseline even by 2030. The growth rate post-2030 fell relative to pre-COVID projections. The weaker economy, slower inflation, and aggressive Federal Reserve policy translated into sharply lower projections of interest rates for about a dozen years (Figure 2).[9] The average rate falls to 1.1 percent by mid-decade before rising to its pre-COVID baseline value (2.9 percent) by 2034 and then rising further to 4.1 percent by 2050. That is, the projection implies that nominal interest rates will rise above the nominal growth rate around 2042 and will exceed the growth rate by 0.6 percentage points by 2050. These economic projections help drive the budget outcomes discussed below.

2. Effects of COVID: Comparing the pre-COVID Baseline and Current Law

Non-interest spending spiked in 2020 (Figure 3), mostly because of the CARES Act. Spending rose by 11 percent of GDP relative to the pre-COVID baseline but is projected to fall

[8] Implementing the adjustments indicated by the fiscal gap does not stabilize debt after the target year – say 2050; it only adjusts tax and spending trajectories so that the debt hits a target by 2050. Under all the scenarios considered in this paper, the debt-to-GDP ratio would continue rising after hitting the specified target in a specified year.

[9] Figure 2 shows effective interest rates, the ratio of net interest payments in a given year to the sum of (a) half of the primary deficit in that year and (b) debt outstanding at the beginning of the year.

rapidly in subsequent years and to return to about its pre-COVID baseline projection of 20.8 percent by 2030. After that, non-interest spending under both the pre-COVID and current law baselines rises by about 2.5 percent of GDP through 2050. These spending increases are driven mainly by health care (Medicare, Medicaid, CHIPS, and exchange subsidies) and, to a lesser extent, Social Security.

Figure 4 shows that revenues dip slightly in 2020 and 2021 but regain pre-COVID shares of GDP by 2022 and essentially mimic pre-COVID shares thereafter. Of course, with post-COVID GDP lower than under the pre-COVID baseline, the projected level of revenues is still substantially below what had been expected in January. Revenues rise more slowly than non-interest spending, however. Between 2030 and 2050, revenues are projected to rise by less than 1 percent of GDP, reaching 18.6 percent of GDP under the both current law and the pre-COVID baselines, with the only changes over time due to bracket creep in the income tax and a slight increase in payroll tax revenues.

As a result of these changes, the primary deficit spikes in 2020 – exceeding 14 percent of GDP – but then falls sharply in the next few years and then hews closely to its projected values under the pre-COVID baseline (Figure 5). The primary deficit rises gradually from 3.2 (3.1) percent of GDP in 2030 to 4.5 (4.6) percent of GDP in 2050 under current law (the pre-COVID baseline).

Under the current law projections, interest payments plummet and then explode (Figure 6). Despite the increase in COVID-related debt, net interest payments fall from about 1.6 percent of GDP currently to 1.1 percent in 2024-5 because of the projected decline in interest rates. But as a result of economic growth and rising debt, both of which raise interest rates, interest payments rise to 2.2 percent in 2030 and continue rising over time, reaching 7.4 percent

of GDP under current law in 2050, slightly higher than the 7.2 percent of GDP projected under the pre-COVID baseline. Both figures, however, far exceed the peak historical net interest level of 3.2 percent of GDP in 1991.

Figure 7 shows the unified deficit, combining the effects of primary deficits and interest payments. The deficit in 2020 reaches 16 percent of GDP – more than 11 percent of GDP larger than was predicted in the pre-COVID baseline, and much higher than even the peak deficit in the Great Recession – about 10 percent of GDP. The effect is temporary, however. Deficits are projected to decline sharply after 2020 and to return to their pre-COVID projected share of GDP by 2024. At that point, relative to the pre-COVID baseline, the projections imply that non-interest spending will be about 1 percent of GDP higher, net interest payments will be about 1 percent of GDP lower, and revenue will raise the same share of GDP. By the end of the decade, the deficit is projected to be 5.3 percent of GDP under current law.

The projected 2020-2030 unified deficit rose from $14.2 trillion in the pre-COVID baseline to $16.3 trillion under current law. Excluding net interest, legislative changes added $2.6 trillion to the projected deficit – more than the entire increase in deficits. The effects of macroeconomic changes added another $1.3 trillion, and other changes accounted for $0.4 trillion more. Despite these increases in spending and reductions in revenue, net interest payments are projected to decline by $2.2 trillion because of sharply lower projected interest rates**.**

After 2030, the unified deficit continues to rise under both the pre-COVID baseline and the current law scenario. By 2050, the unified deficit reaches almost 12 percent of GDP under both current law and the pre-COVID baseline.

Figure 8 shows the impact of COVID on the public debt. Before the pandemic, the US

already had historically high debt as a share of GDP—the highest since just after the end of World War II. Under the pre-COVID baseline, the stock of outstanding public debt would have been 81 percent of GDP at the end of fiscal 2020 and 82 percent by the end of fiscal 2021. Now, analogous current law projections are 98 percent and 104 percent, respectively. Projected debt rises gradually for the rest of the decade, reaching 109 percent of GDP in 2030 under current law, compared to 98 percent under the pre-COVID baseline.

After 2030, rates of debt accumulation pick up, because of rising primary deficits and rising interest payments. By 2050, the debt rises to 190 percent of GDP under current law compared to 180 percent in the pre-COVID baseline. Essentially, the higher deficits incurred in 2020 and 2021 are carried forward on a long-term basis but since interest rates are lower than growth rates on average over the 2020-2050 period, the effect relative to GDP is slightly dissipated.[10]

3. Current law versus current policy

While comparing the pre-COVID baseline to current law shows the impact of the pandemic, comparing current law to current policy shows the impact of certain "business as usual" changes that Congress tends to make. These differences occur during the first 10 years, given our process for generating projections, but they have ramifications for longer-term

[10] Our current law baseline differs slightly from CBO (2020f). CBO uses its own estimates for Social Security and Medicare, whereas we use estimates from the Trustees of those programs (scaled for GDP). We allow other mandatory spending and discretionary spending to remain constant shares of GDP from 2030 to 2050. CBO has them declining somewhat. Nevertheless, both our projections and CBO's generate primary deficits of 4.5 percent of GDP in 2050. We use interest rate estimates embedded in CBO (2020f) projections. (Although the projected interest rates reported in CBO (2020f, page 47) are larger than those reported above, the difference is due to different definitions. CBO reports effective interest rates as the ratio of net interest payments in a given year to debt at the end of the previous year. We report effective interest rates as the ratio of net interest payments in a given year to the sum of (a) half of the primary deficit in that year and (b) the debt at the end of the previous year. Finally, CBO generates a debt-to-GDP ratio of 195 percent in 2050, compared to our estimate of 190 percent under current law. CBO (2020f) compares its budget outlook to its 2019 Long-Term Budget Outlook (CBO 2019), which projects a 2049 debt-to-GDP ratio of 144 percent. We compare our current law baseline to CBO's January 2020 baseline – the most recent prior to the pandemic which projects a 2050 debt-to-GDP ratio of 180 percent.

outcomes. Making the temporary provisions of the Tax Cuts and Jobs Act permanent, along with modest adjustments to spending, would raise the 2050 debt-to-GDP ratio to 222 percent compared to 190 percent under current law. By 2050, revenues would be at 17.7 percent of GDP, compared to 18.6 percent under current law; the primary deficit would rise to 5.7 percent of GDP and interest payments would rise to 8.7 percent of GDP, compared to 4.5 and 7.4 percent, respectively, under current law.

4. The Fiscal Gap

Turning to the fiscal gap, Table 1 shows that, under current law projections, obtaining a debt-to-GDP ratio in 2050 equal its 2020 level of 99 percent would (ignoring any macroeconomic feedback effects) require permanent tax increases or non-interest spending cuts totaling 3.2 percent of GDP starting in 2021. This would be the equivalent to a about a 34 percent increase in income tax revenues, a 15 percent increase in all tax revenues, or a 14 percent reduction in average non-interest spending. Because projected interest rates are so low in the next few years, the cost of delaying fiscal consolidation is, at least initially, small. If policy makers wait till 2025 or 2030 to pursue a 2050 policy goal, the required changes would be larger, because the debt must be brought down in fewer years.

Policy makers could choose a net-interest-to-GDP target instead of a debt target. To hold 2050 interest payments equal to 3.2 percent of GDP – the historical maximum for this ratio, obtained in 1991 – would require policy changes equal to about 3.8 percent of GDP starting in 2021.

Under current policy, all the shortfalls are larger. Obtaining the current debt-to-GDP ratio would require policy changes equal to 4.2 percent of GDP starting in 2021. Holding net interest payments to their historical maximum share of GDP would require policy changes of 4.8 percent

of GDP.

5. Sensitivity Analysis

How future economic and budget outcomes evolve depends crucially on how the virus and the economy change over time. There is significant uncertainty about the course of the virus, which creates uncertainty about the path of the economy. But, even for a known course of the virus and known pattern of social distancing behavior, there is considerable uncertainty about the course of the economy.[11] This uncertainty stems from (1) the unique nature of the pandemic as a recession-causing event, (2) the sheer depth of the drop in GDP and employment experienced in the spring of 2020, and (3) the massive reallocation of workers, jobs, and economic activity across sectors of the economy that will be required in the wake of the pandemic. In fact, the economy has recovered faster than many expected. CBO's July projections implying that the economy will not recover to close to its the pre-pandemic projected GDP level until the end of the decade are now viewed by some as overly pessimistic in terms of the speed of recovery.

But after the Great Recession, CBO (and many other forecasters) expected the economy to recover to close to its pre-recession path, which, in the end, did not happen. As a result of prolonged slower growth, CBO eventually significantly lowered its projections for potential GDP.[12] CBO's current GDP projection is that real GDP will only be moderately lower in 2030 than prior to the pandemic. If the economy's gap from the pre-COVID path is larger than projected, the fiscal outlook will likely be worse, with the obvious caveat that if interest rates fall

[11] CBO assumes that social distancing peaked in April 2020 and will diminish to two-thirds of the peak level later in 2020 and continue to fall through 2021 regardless of any resurgence in transmission (Congressional Budget Office 2020b).

[12] In its January 2009 budget outlook, CBO (https://www.cbo.gov/sites/default/files/111th-congress-2009-2010/reports/01-07-outlook.pdf) noted that its projection of potential output in 2018 had been revised downward by 1 percentage point. In 2014, (https://www.cbo.gov/publication/45150), CBO wrote that its projection of 2017 potential GDP had fallen by more than 7 percent since 2007.

enough, the overall fiscal position could be improved. However, projected rates are already very low already, so there is a limit on how much lower they can fall. To address the possibility that the economy may not recover as close to the pre-COVID path, we use CBO's interactive workbook to apply the agency's rules of thumb for the impact of alternative economic scenarios on budget projections and find that if the annual productivity growth rates were lower than projected by 0.5 percentage points for each of the next 10 years, the debt-to-GDP ratio would rise by an additional 12 percentage points by 2030.[13] CBO (2020f) shows that if the annual growth rate of total factor productivity is 0.5 percentage points lower than projected, debt will rise to 239 percent of GDP in 2050 under current law, compared to the 195 percent figure in its baseline.

Given the importance of net interest payments for the long-term budget outlook, we also consider a low-interest rate scenario. Figure 2 shows that projected rates reach a minimum in 2025, and then rise more or less steadily through 2050. In our alternative scenario, we assume that interest rates stay constant at their 2025 levels through 2050. Under this specification, the 2050 debt-to-GDP ratio reaches 134 percent under current law and 157 percent under current policy. CBO (2020f) shows that if interest rates are 1 percentage point higher (lower) than predicted over the next 30 years, the debt-to-GDP ratio will be higher (lower) by 69 (46) percent of GDP by 2050 under current law.

6. Social Security, Disability, and Medicare trust funds

All the estimates above—both current law and current policy—assume that future shortfalls in the Social Security, Disability, and Medicare (Part A—hospital insurance) trust

[13] Congressional Budget Office (2020d).

funds are financed by government borrowing.[14] However, under existing law, benefit payments may only be made from the trust funds (which receive dedicated sources of revenue, the main source being payroll taxes). In practice, lawmakers have generally maintained the notion that Social Security and a portion of Medicare benefits net of premiums should be funded by dedicated taxes rather than general revenues. The April 2020 Trustees reports, based on projections that predate the impact of the COVID-19 pandemic, showed that in the absence of policy changes, Social Security and Medicare would need to cut benefits by 21 and 10 percent, respectively, or raise taxes considerably, when their trust funds were projected to be exhausted in 2035 and 2026, respectively.[15]

There are many possible interactions between the COVID pandemic and the Social Security trust fund. For example, lower current wages and high current unemployment imply lower payroll tax revenues until the economy recovers but also lower future benefits for the cohort that is turning 60 this year, because of the way benefits are calculated.[16] This quirk is clearly unintended and will likely be addressed by Congress in the near future. In addition, more older Americans may retire this year, having been laid off in the current downturn. Furthermore, if the pandemic makes work more dangerous for older Americans, labor force participation of older workers may be suppressed for some time. And the expansive pandemic unemployment insurance is likely to reduce disability claims this year but could raise them next year as the unemployment rate is projected to remain high.

As to the Medicare trust funds, the potential impacts are much greater than during a

[14] CBO (2020e) provides new projections for the major federal trust funds.

[15] Board of Trustees of the Old-Age Survivors Insurance and Federal Disability Insurance Trust Funds (2020), and Boards of Trustees of the Federal Hospital Insurance and Federal Supplemental Medical Insurance Trust Funds (2020).

[16] Biggs (2020).

normal downturn or even the Great Recession, because health care expenditures are a central factor as the pandemic plays out. Covering the cost of treating covered COVID-19 patients increases Medicare spending, but the sharp drop in elective procedures, at least temporarily, works in the opposite direction.

An additional implication of COVID on the trust funds has to do with the change in projected interest rates. Lower interest rates raise the present value of future spending obligations, like those for Social Security and Medicare. In the past, policymakers have chosen to pre-fund a certain share of these obligations. With lower interest rates, any level of pre-funding will be more difficult to achieve; that is, pre-funding will require higher taxes or lower spending than it did under higher interest rates. Policymakers will have to choose between imposing higher burdens to reach a given level of pre-funding or pre-funding these programs to a lesser extent than in the past considering the less favorable payoff from doing so.[17]

We estimate the effects on the 2050 debt-to-GDP ratio of funding Social Security, Disability Insurance, and Medicare part A on a pay-as-you-go basis—that is, with some combination of tax increases or spending cuts when the trust funds are exhausted. If Medicare Part A is funded, the 2050 debt-to-GDP ratio would fall by 11 percentage points. If Social Security and Disability are funded when the respective trust funds are exhausted, the 2050 debt-to-GDP ratio would fall by 22 percentage points.[18] These estimates, though, only partially incorporate the effects of the COVID pandemic on the trust funds. For 2020-2030 data, we employ CBO projections, which have been updated for COVID. For subsequent years' data, the

[17] When the Social Security or Medicare trust fund runs an annual surplus, the excess funds are invested in bonds at the Treasury. The interest rate that the Treasury Department pays to these programs depends on recent average yields on federal debt. As a result, lower interest rates reduce the returns that the trust funds receive and thus make it more costly to achieve a given level of pre-funding. (In a similar fashion, low rates of return make it more difficult for pension funds to finance future obligations.)

[18] Committee for a Responsible Federal Budget (2017) obtains similar effects.

estimates are based on growth rates of revenue and spending from the latest Social Security and Medicare Trustees Reports, which have not yet been updated in response to the pandemic.

C. Perspectives and Interpretations

The sharp changes in the economy brought about by COVID and the associated policy responses raise several interesting issues for fiscal policy. First, the debt-to-GDP ratio is projected to rise by 25 percentage points between 2019 and 2021 and could rise by more if there is new legislation or a weaker-than-expected recovery. This increase is sizable but is not out of line with other debt build-ups over the past century. For instance, the coupling of World War I with the 1918 flu pandemic led to a debt-to-GDP increase of 30 percentage points over 3 years. World War II raised the debt-to-GDP ratio by 64 percentage points over 6 years. The Great Recession boosted the debt-to-GDP ratio by about 31 percentage points over 4 years.

Second, the previous peak in the debt-to-GDP ratio—106 percent—occurred just after World War II, following which the debt-to-GDP ratio gradually dwindled to 28 percent over the ensuing 35 years, an outcome that contains both good and bad news for the current long-term fiscal shortfall.[19] Between 1945 and 1980, interest rates on government debt were often below the economic growth rate, which helped to reduce the debt-to-GDP ratio. Likewise, although economic growth is projected to be lower than during the earlier post-war period, so are interest rates, which as discussed above are projected to remain below growth rates for the next 30 years, providing the same help in reducing the debt-GDP ratio over time.

However, the federal government maintained balanced primary budgets on average over the 1945-1980 period. In contrast, we project sizable and growing primary deficits as a share of GDP even after the pandemic and its economic aftermath subside. These primary deficits are

[19] Gale (2019a, 2019b).

sufficiently large to cause debt to grow inexorably relative to GDP despite lower interest rates, and there is nothing in the forecast to suggest that this growth will slow even after 2050.

Approaching a balanced primary budget through reductions in spending would be much more challenging now than in the earlier post-war period, because of differences in demographics and budget composition. In 1945 and the years that followed, defense spending was an important part of the federal budget, expenditures on Social Security were small, and Medicare and Medicaid did not exist. In fiscal year 2019, the last pre-pandemic fiscal year, federal spending on defense was just 3.2 percent of GDP, while spending on the three major entitlement programs accounted for 10.5 percent of GDP and over half of non-interest federal spending. Moreover, spending on the entitlement programs is projected to grow faster than GDP over the next three decades, due to population aging and health care cost growth. At the same time, with greater inequality than during the period ending in 1980, there is stronger support for increased spending on social services. One may also conjecture that demand will increase for health insurance coverage, a stronger social safety net, and more redistribution, given the differential impact of both COVID illness itself and the associated economic burdens. In short, the upward pressure on federal spending is much stronger now than in the past.

Reducing the primary deficit through tax increases may prove difficult politically, but there is room to maneuver. As a share of GDP, federal revenues equaled 16 percent in 2020. If TCJA and other temporary provisions are extended in the usual manner, and revenues are projected to total just 17.0 percent over the 2020-2050 period. In the fifty years prior to 2020, revenues averaged 17.4 percent of GDP and reached a high of 20.8 percent in 2000.

Third, a key factor in the fiscal picture is the path of interest rates. The reduction in projected interest rates unambiguously improves the federal government's overall fiscal stance—

because it is a net borrower. We can certainly borrow more and consume more with low interest rates and not hurt future generations (who can in turn borrow more from later generations). But the optimality of this pattern may fall apart if interest rates subsequently rise, resulting in higher interest rates on higher levels of debt,[20] particularly if this rise in interest rates is not accompanied by a sufficiently large increase in the rate of productivity growth.[21]

The path of interest rates will also depend in part on monetary policy. But the relevance of the Fed to the fiscal picture goes well beyond its role in the determination of interest rates. The Fed has sharply expanded its balance sheet since the onset of the pandemic, acquiring large quantities of the new government debt being issued.[22] In addition, through facilities created under its emergency lending authority, it has taken on the debts of companies and state and local governments. Some have argued that these facilities, which were utilized in response to the financial crisis and expanded in scope in the current situation, signify a growing role of the Fed in conducting fiscal policy (e.g. Plosser 2012, Warsh 2020). Alternatively, however, the facilities can be viewed as an extension of the Fed's traditional lender of last resort role which reflect the relative shift in financial activity since the Fed's creation away from bank loans toward securities traded in capital markets (Labonte 2020). Moreover, the facilities can only address temporary interruptions to liquidity via loans. Addressing solvency issues, which requires fiscal spending authority, has been left to Congress and the Administration (Powell 2020).

[20] Ball, Elmendorf, and Mankiw (1998).

[21] If the increase in interest rates is in response to higher productivity, the effect on debt sustainability is unclear (Sheiner 2018).

[22] Data in CBO (2020c, table 2) imply that Fed holdings of public debt will rise by about 70 percent of the increase in public debt from 2019 to 2021.

Nonetheless, the previously sharp lines between monetary policy, fiscal policy, and debt management policy have arguably blurred somewhat in recent years (Greenwood, Hanson, Rudolph, and Summers 2014). With the Federal Reserve's adoption of paying interest on reserves held by banks, bank balance sheets have become functionally similar to Treasury bills.[23] And there may be concerns over the extent to which the Treasury can use changes in the federal debt's maturity structure as a debt management tool while the Fed is pursuing its own policies to influence the term structure of interest rates. Finally, as the Fed's tool kit has expanded in recent years, so too may the pressure to use those tools to implement fiscal or debt management objectives (e.g. Plosser 2012, Warsh 2020).

III. Effects of COVID-19 on the State and Local Sector

The COVID-19 pandemic presents the states with potentially serious fiscal problems, but ones that differ from the federal situation. State and local governments generally must balance their operating budgets each year, which not only constrains their behavior, but does so in a way that is particularly damaging to the macroeconomy during a business cycle contraction. Specifically, when an economic downturn reduces revenues, state and local governments may be forced to cut spending or raise other taxes to make up the budget shortfall (e.g. Poterba 1994 and Clemens and Miran 2012). Not only do these changes deprive taxpayers of valuable services or reduce their disposable income in a time of economic stress, but they also impede the economic recovery.

This dynamic was particularly strong in the recovery from the Great Recession (e.g. Cashin, Lenney, Lutz, and Peterman 2018). As shown in Figure 9, state and local government purchases of goods and services—the state and local government contribution to GDP—were

[23] Several international central banks also have the authority to pay interest on reserves.

flat, on net, over the course of the economic expansion following the Great Recession. In contrast, these purchases rose significantly in most prior expansions. The atypical fiscal behavior was caused by a number of factors: tax revenues were very hard hit by the Great Recession and rose only slowly thereafter given the historically subdued economic growth[24]; grants-in-aid from the federal government outside of healthcare declined to levels below recent historical norms after the stimulus put in place in response to the recession ran its course;[25] contributions to pension plans rose notably, crowding out other budget items; and state and local governments chose to sharply curtail their borrowing for infrastructure projects.

Nonetheless, the states and localities entered the COVID-19 pandemic in a relatively strong fiscal position along some dimensions. State total balances—reserve accounts (so-call "rainy day" funds) plus general budget surpluses—stood at $119 billion in fiscal year 2019, equal to 14 percent of general fund expenditures – a historic high (NASBO 2020). And the decision to sharply curtail infrastructure investment in recent years led to less need for borrowing and a gradual reduction in debt, which fell from around 20 percent of GDP prior to the financial crisis to around 14 percent currently.[26] Moreover, the federal government has provided aid to the states and localities of over $200 billion to date.

Nonetheless, many believe that these savings and federal aid will be insufficient to meet the scale of the revenue losses and spending requirements these governments will experience over the next few years, and the state and local sector will again generate meaningful economic

[24] See Seegert (2015, 2020) for discussion and analysis of the increasing volatility of state and local tax revenue with respect to the economic cycle.

[25] Grants for Medicaid rose notably following the passage of the Affordable Care Act. However, these grants required a corresponding increase in Medicaid outlays and did not loosen state budget constraints.

[26] Authors' calculations based Financial Accounts of the U.S. and BEA. In contrast to these governments' marketable debt, unfunded pension liabilities held constant in recent years after increasing in the wake of the Great Recession (e.g. Aubry, Crawford, and Wandrei 2018).

headwinds for the economic recovery (e.g.; Bernanke 2020). Moreover, state and local governments are responsible for many public goods that are crucial to the response to the pandemic – e.g. public health departments and public hospitals. Budget strain may impair their ability to mount an effective response to the COVID-19 outbreak.

Although most states have balanced budget requirements of some kind, some are more stringent than others. Some, for example, require mid-year adjustments to spending and taxes to offset any shortfalls, while others only require governors to submit budgets that they expect to balance. Thus, revenue shortfalls in the near term can constrain spending for many years, as we saw in the Great Recession. Capital expenditures—which are typically not subject to balanced budget requirements—are also surprisingly cyclical, perhaps because spending required to plan and maintain capital projects comes out of operating budgets, governments may wish to avoid the costs of servicing debt during times of economic stress, and because many areas require voter approval for any bond issuance, which is less likely to be forthcoming during an economic downturn. Finally, unemployment benefits, which are also not subject to balanced budget requirements (when state trusts funds run out of money, states can automatically borrow from the federal government), leave debts that need to be repaid within three years to avoid having the federal government raise the federal unemployment tax.

A. Estimates of Revenue Losses from COVID

As shown in Table 2, a number of researchers have estimated the likely effects of the pandemic on the fiscal health of the states and localities. The estimates of state and local revenue losses over the two fiscal years starting from the onset of the pandemic vary widely, ranging from $130 billion (White, Crane, and Seitz, 2020) to $875 billion (Bartik, 2020).[27] The range

[27] Fiscal years for states generally end on June 30, so these two fiscal years end June 30, 2021.

reflects both differences in underlying economic assumptions, differences in coverage (all state and local revenues, or some subset), as well as differences in methodology.

The top three estimates in Table 2 all rely on the work of Fiedler, Furman, and Powell (2020), who estimate that a 1 percentage point increase in the unemployment rate lowers real per capita total state revenues by 3.7%. Both Bivens and Bartik blow up this number by about a third to roughly account for the impact of COVID-19 on local taxes. These estimates tend to show very large effects of the pandemic.

A second method—relied on by Clemens and Veuger (2020a)—uses the historical relationship between changes in personal income and income tax collections, and changes in personal consumption and sales tax collections[28]; White, Crane and Seitz adopt a broadly similar approach at the state level. Whitaker (2020a, b) uses a variety of methods to project changes in the whole suite of state and local revenues and fees. Finally, Dadayan (2020a) uses information on states' own forecasts of revenue losses to project losses for the nation as a whole.

The estimates in the literature that relate changes in economic conditions to changes in revenue collections seem appropriate as a general rule of thumb to know what the effect of a typical recession might be on revenues. Indeed, Fiedler, Furman, and Powell note that their estimate is intended to capture not only the direct effect of unemployment on revenues, but also any indirect effects stemming from changes in economic conditions that occur in recessions. But there are reasons to believe that these historical relationships may not prove to be very accurate for the current very unusual recession. First, as noted by Chetty et al. (2020), while all recessions affect those with the lowest incomes the most, this one appears to have hit low-wage workers

[28] Clemens and Veuger (2020b) update the income and sales tax estimates in Clemens and Veuger (2020a) and also extend the estimates by accounting for other state taxes, as well as local taxes. They estimate a total state and local government revenue loss due to the COVID-19 pandemic of $240 billion in fiscal year 2021. These papers, like this paper, base their COVID-19 shock on the evolution of CBO economic projections.

disproportionately hard relative to historic norms; these individuals often work in service industries that have been decimated by a fall in demand and are also the least likely to be able to work from home (Dingle and Neiman, 2020). Indeed, data on employment rates by income group from Opportunity Insights (https://tracktherecovery.org/) suggest that the recession is basically over for high-wage workers, but still very severe for low-wage workers. This concentration of unemployment among the lowest-paid workers means that the increase in the unemployment rate may be less consequential for state and local revenues than in the past.

Second, most recessions are accompanied by stock market declines. Stock market declines depress revenues by depressing taxable capital gains realizations and are likely associated with lower taxable business income. But although the market did fall by almost 30% in March of this year, the recovery in equity prices was swift and, as of September 17, the market is up about 3% for the year, suggesting that capital gains tax revenues won't be significantly depressed relative to a typical year.[29]

Third, the huge fiscal response to this recession at the federal level has important implications for state and local tax revenues.[30] While the $1200 rebate checks sent to most families are not taxable, most of the PPP spending will likely show up as higher profits for sole proprietorships, partnerships, and S-Corps (all taxed at the individual level),[31] and the large

[29] The effects of changes in the stock market tends to affect tax receipts with a lag, as much of the effect occurs when people make estimated tax payments in January or final payments in April.

[30] E.g. Bhutta, Blair, Dettling, and Moore (2020) demonstrate that the CARES Act cash assistance to household was sufficient to allow almost all families to cover normal expenses for six months. A share of this aid is taxable at the state level.

[31] Autor et al (2020) calculate that the PPP loans created 2.3 million jobs at an average annual wage of $60,000. These loans covered only 2½ months of payroll, meaning that only $29 billion (2.3 million*60,000/12*2.5) went to firms who otherwise would have laid off their workers, indicating that the remaining $489 billion accrued to business profits. While the CARES explicitly stated that PPP money would be untaxed, Treasury guidance established that no deductions could be taken against these funds, implicitly making it taxable.

expansion and increase in unemployment benefits is taxable in most states with an income tax.[32] Projections based on historical relationships between tax collections and the unemployment rate will miss these increments to taxable income, as they far surpass anything that has been enacted in the past. Projections based on the regressions on personal income, on the other hand, will capture the higher income from unemployment benefits, but will also capture the approximately $300 billion in rebate checks, which are not taxable.[33]

Fourth, the patterns of consumption changes in this recession are very different than in previous recessions. The drop in consumption is far larger than observed in previous recessions—suggesting that regressions based on income or the unemployment rate will understate the decline in sales tax revenues. But the composition of the consumption decline has also changed dramatically. Consumption of services—which are usually far less cyclical than consumption of goods—has plummeted, while consumption of goods has shown much more resilience. Given that most services are untaxed, this might lessen the hit to sales tax collections. State and local governments also rely importantly on fees and charges, however. With driving and flying way down, and many public parks closed, this category of revenues is likely to suffer much larger declines than in previous recessions.

Finally, as we show below, even after making various adjustments, these types of regressions are very sensitive to the experience of the Great Recession, when revenues fell sharply even given the very large rise in unemployment. It is unclear whether that outsized relationship reflected a structural change or something specific to the Great Recession.

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[32] Alaska, Florida, Nevada, New Hampshire, South Dakota, Tennessee, Texas, Washington, and Wyoming do not have income taxes on earned income and so don't tax unemployment benefits. In addition, California, Montana, New Jersey, Pennsylvania, and Virginia exempt unemployment benefits from income taxes. https://www.kiplinger.com/slideshow/taxes/t055-s001-state-taxes-on-unemployment-benefits/index.html

[33] However, this can addressed: E.g. Clemens and Veuger (2020a) are well aware of this, of course, and take out the rebate checks when doing their calculations.

B. A Reexamination of the Historical Relationships between State and Local Revenues and the Economy

In table 3, we reexamine some of the historical relationships at the national level. As noted by Fiedler, Furman, and Powell (2019), examining the relationship between actual tax revenues and economic conditions can lead to an underestimate of the true coefficients, because state and local governments may respond to lower anticipated tax revenues by raising taxes and fees. However, they show that such effects are quite modest, and so we ignore these policy responses here. In the "bottom up" approach we focus on below, we control for any such policy changes directly by using existing tax codes to evaluate the effects of the current recession on state and local revenues.

We first examine the relationship between the log difference of real state and local income taxes and sales taxes and two economic indicators: the change in the unemployment rate and the log change in real per capita personal income. In order to try to assess the importance of changes in stock market returns in depressing tax revenues during recessions, we include the lagged change in the log of the inflation-adjusted Wilshire 5000 index.

The regressions illustrate a few important points. First, excluding 2009 leads to much smaller estimates of the effects of changes in the economy—regardless of the economic indicator—on both income and sales tax collections. Second, including a measure of stock price changes similarly lowers the estimated coefficient, and including stock prices and excluding 2009 lowers the estimates yet again. For example, the effect on the percentage change in state and local income tax revenues from a one percentage point increase in the unemployment rate falls from -5% to -2.7%, or by about ½, and a similar change is seen in the coefficient on the change in personal income. Third, and more broadly, the estimates are relatively variable across

specifications. Using the change in unemployment projected by CBO for 2020 as a whole, for example, the estimated revenue losses from income and sales taxes decline from roughly $160 billion using the estimates in the first column to about $88 billion using the estimates in the fourth column.

We also attempt to understand the relationship between changes in personal income and changes in income tax revenues. The Clemens and Veuger (2020a) paper discussed above, for example, uses an elasticity of state income tax revenue with respect to personal income of 1.6, even though state income tax systems are not overly progressive. We note that a large and growing share of personal income is not subject to taxation and is not very cyclical—including Medicare, Medicaid, Social Security, and imputed rent on owner-occupied housing. That means that when personal income falls by 1% in a recession, the "taxable" and more cyclical components fall much more, giving rise to a coefficient on personal income greater than 1 in a regression of tax collections on personal income. To test whether this wedge between taxable and total personal income accounts for the large elasticity of state income tax revenue with respect to personal income, we run the regression using the "taxable" portion of personal income. We define this as all personal income less: governments transfers other than unemployment insurance (which is taxable in most states); imputed rent on owner-occupied housing; and employer-provided benefits like health insurance and pensions.

As shown in the third row of Table 3, a regression of income tax revenues on taxable personal income shows a much smaller coefficient. Indeed, it is just below 1 once the stock market is included in the regression.

But the large differences between this recession and previous ones suggest that relying on past experience may not necessarily provide very accurate projections of budget pressures for

state and local governments. Indeed, data on state government tax collections suggest that, at least through mid-summer, the revenue shock may not have been as severe as suggested by some of the above estimates.

Figure 10 displays the percent change in year-to-date tax collections through July relative to 2019.[34] Tax revenue plummeted following the onset of the pandemic and as many states followed the federal government's decision to delay final 2019 and estimated quarterly 2020 income tax payments from April and June to July. The decline in collections was historic and exceeded the declines experienced as a result of the Great Recession (Gordon, Dadayan, and Rueben 2020). However, year-to-date personal income tax collections rebounded smartly in July as delayed payments came in. Sales taxes staged a more muted recovery in June and July, reflecting the broader economic recovery as well as delays in filling and remittance deadlines in some states (Dadayan 2020b).

Overall, year-to-date personal income tax and sales tax collections in July were down around 2 percent and 3.5 percent, respectively, relative to last year; corporate collections were down a much larger 11 percent. The declines in personal income taxes and sales taxes are smaller than the decline in economic activity over the same period. This divergence likely reflects, in part, the effects of the massive fiscal stimulus enacted by the federal government – e.g. the boost to personal income attributable to the expanded UI program. Nonetheless, tax collections remain depressed due to the pandemic. Moreover, year-to-date growth in collections

[34] The data are collected by State and Local Finance Initiative at the Urban Institute: https://www.urban.org/policy-centers/cross-center-initiatives/state-and-local-finance-initiative/projects/state-tax-and-economic-review/data-subscriptions.

could well fall back in the months ahead – e.g. the end of the $600 supplement to UI payments in July will reduce taxable personal income.[35] [36]

Given the unusual nature of the current economic downturn, and the corresponding uncertainty over the appropriateness of using elasticities based on historic experience, our preferred approach is to do a more detailed "bottom-up" method that accounts for the geographic variation in the magnitude of the impact on employment and consumption, the distributional effects, and the impact of federal fiscal policy on taxable income. We attempt to a detailed projection of revenues through the end of calendar 2022. These bottom-up estimates should be viewed as complementary to the more standard top-down estimates discussed above.

C. A Bottom-Up Methodology for Calculating State and Local Revenues

Our bottom-up approach explicitly accounts for heterogeneity across states and estimates revenue losses on a state-by-state basis. We consider state and local governments jointly by state. While this is appropriate given the substantial fiscal linkages between a state and its localities, it does gloss over the substantial heterogeneity in fiscal conditions at the local level.[37]

We consider five categories of revenues for state and local governments: individual income taxes, which make up 16% of general own-source revenues (revenues excluding utility, liquor store, and insurance trust fund revenue, as well as grants from the federal government);

[35] In addition, the 2020 year-to-date collections include revenue from the pre-pandemic months of January and February; these months will become a relatively smaller share of year-to-date collections as additional months of collections come in. Dadayan (2020b) documents that the percent declines in cumulative tax collections from March through July relative to 2019 are larger than the year-to-date percent declines reported here. Finally, looking to 2021 tax revenue, final tax payments for the 2020 tax year, to be collected in 2021, may well be weaker than 2019 final payments.

[36] See Gordon, Dadayan, and Rueben (2020) for a much more detailed, point-in-time description of state and local government finances as of July 2020.

[37] See Chernick, Copreland, and Reschovsky (2020) for a detailed examination of the effect of the pandemic on the fiscal position of large cities; these authors find substantial variation in the fiscal effect across cities.

sales taxes, which account for another 16%; corporate income taxes, which make up just 2% of general own-source revenues; and state and local fees and charges, which make up 44%. House prices have held up well so far this recession and property taxes respond to changes in market values with a lag of several years (e.g. Lutz 2008 and Lutz, Molloy, and Shan 2012.). Accordingly, we assume no change to property taxes, which make up 22% of own source revenues.[38]

Our basic methodology uses recent data on consumption and employment to measure the "shock" created by COVID, and projects that shock forward using the difference between CBO's economic projections in July and January (i.e., pre-COVID) and CBO's estimate of social distancing. As discussed above, the CBO forecast is quite a bit more pessimistic than that of many forecasters, both in the sense that activity has already rebounded far more quickly than they anticipated, and because they assume that the shock initially created by social distancing creates enough economic damage that regular recession-type dynamics take over. In the CBO projection, real GDP doesn't get back to its pre-COVID baseline for almost a decade.

1. Projecting State and Local Income Taxes

To calculate state and local income tax revenues, we create a small-scale microsimulation model using data from the Current Population Survey (CPS) and the NBER's Taxsim, which, given a set of inputs about taxable income, calculates individual income tax liabilities by state using each state's tax code.[39] Local taxes are, on average, 9% of state taxes. In most states with

[38] Delinquencies could push down property tax revenues. However, even during the housing crisis coincident with the Great Recession, delinquencies appear to have had only a minor effect on property tax collections. A decline in commercial real estate prices could, however, eventually push down property tax collections. See Chernick, Copeland, and Reschovsky (2020) for a discussion of these issues. These authors, in their assessment of the pandemic on city government finances, assume no change in property tax revenue in 2021 in their less severe scenario and only a 0.5 percent decline in their severe scenario.

[39] Taxsim currently has state income taxes only through 2018, but there have been few significant changes in tax laws since then. We use Taxsim based on the 2018 state tax codes.

significant local income tax revenue, taxes are based on the state tax liability or state taxable income, so we simply gross up the state revenues we project to account for local taxes, using data from 2017 on the ratio of local to state income tax revenues. In using Taxsim, we calculate annual tax liabilities, as opposed to annual tax payments – e.g. final tax payments are typically not due until April of the following year.

We use the three most recent years of the CPS in order to have a large enough sample to accurately project revenues at the state level. We adjust wages, dividends, interest, property income, and capital gains by changes in the national aggregates to create "2020" versions of the CPS (including adjustments for inflation). We run this sample through Taxsim to create a baseline projection of tax revenues. As discussed in Appendix 2, the projected revenues from the CPS/Taxsim combination are quite similar to actual state income tax revenues for the nation as a whole but don't predict quite as well on a state-by-state basis. We suspect this result is due, at least in part, to the Census method of "rank proximity swapping" whereby the Census swaps income above some threshold across respondents across states in order to preserve privacy. This means that we underpredict income and tax revenues in high-income states like California, and overpredict them in lower-income states like South Carolina. We use the relationship between predicted and actual state income tax revenues to reweight the CPS data so that we match both state-specific and national tax revenues. The appendix describes our calibration method.

a. Distribution of unemployment by state and income group

In order to capture the heterogeneity across state and across income groups in the effects of the recession, we use data on employment by state by income group from Opportunity Insights, which is gathered through partnerships with Paychex, Earnin, and Intuit.[40] Opportunity

[40] (https://tracktherecovery.org/)

Insights reports daily data on changes in employment relative to January 2020 in each state for three sets of workers: those in the bottom quartile, those in the middle two quartiles, and those in the top quartile.[41] We average these data by month so that we have for every month between April and June, for each state and income group, the decline in employment attributable to COVID.[42] Although these data only contain information on three broad income groups, the differences across the groups are stark enough as to capture a significant share of the distributional impact of this recession. Figure 11 below, reproduced from the Opportunity Insights website, shows that unemployment increased by about 10% for the highest quartile of workers during the shutdowns, but rebounded very quickly and, by the beginning of June, was no lower than it had been at the beginning of the year, whereas employment for the bottom quartile of workers fell almost 35%, and remained over 15% below the January level by the end of June. We adjust the size of the employment declines each month so that, rather than being relative to January (as the OI data are), they are relative to the employment levels in CBO's January 2020, pre-COVID economic projections (assuming that employment would have increased at a constant rate across the states). That is, we account for the fact that simply hitting January's employment doesn't mean that the economy is back to the pre-COVID baseline.[43]

The OI data currently go through August and, to calculate Q3, we simply assume that September employment is unchanged from August. To project employment into the future, we assume that the recovery in employment for each state follows the recovery that CBO has in their

[41] Opportunity Insights states that their quartile cutoffs for the bottom and top cutoffs are 27,000 and 60,000, respectively. When we examined wages in the CPS, we found these cutoffs put far too many people in the top quartile, which would have led unemployment to be understated. Instead, we used the 25% and 75% percentile cutoffs from the CPS data to define these groups.

[42] Employment declines were very small in March, so we begin our analysis in the second quarter

[43] The OI data come from the private sector, whereas we are implementing the shocks for all workers. Because the private sector experienced, on average, somewhat higher employment losses than the public sector, we view the shocks to wages as an upper bound.

July 2020 economic projection, updated for incoming data. To compute CBO's shock and subsequent recovery, we compare the path of unemployment in their January 2020 economic projection with that in the July 2020 economic projection. We use the change in the unemployment rate between the two projections as the change in unemployment due to COVID, which we call the "shock."

One issue we had to contend with is that the incoming data have been far stronger than anticipated by CBO in their July projection. For example, CBO projected that the unemployment rate would be 14 percent in the third quarter, and then begin to decline, hitting 8.6 percent by the second quarter of 2022. In fact, the unemployment rate was 10.2 percent in July and 8.4 percent in August. We assume that CBO simply missed the timing of the recovery, and, rather than assuming the shock continues to dissipate over the remainder of the year, we have chosen to keep it constant at its current value through the middle of 2021, and then allow it to follow the CBO path. While this is a less optimistic projection than many other forecasters, it may be reasonable given that, unlike these other forecasts, it is a current law projection that assumes no additional fiscal stimulus. Furthermore, it provides for the possibility of a "second wave" in the fall that will slow the recovery.

Accordingly, in our simulation, employment remains a constant fraction of its pre-COVID baseline through the second quarter of 2021, and then begins to rise as the "employment shock" dissipates. For example, under CBO's forecast, the unemployment rate falls from 8.6 percent in the second quarter of 2021 to 8 percent in the third quarter, whereas in the January projection, the unemployment rate was 3.5 percent in the second quarter and 3.6 percent in the third. Thus, we measure the shock as declining from 5.1 percent (8.6-3.5) in the second quarter to 4.4 percent in the second quarter. In other words, the shock in Q3 of 2021 is 14 percent below

the shock in Q2. We then use this 14 percent decline in the shock across all the states and income groups to project the change in employment from Q2 to Q3. Using the CBO projection, the remaining shock, relative to Q3 of 2020, is about 70% by the end of 2022. (The unemployment rate is projected to be 6.9 percent whereas in January it had been projected to be 4 percent.) As a result, every state is converging at the same pace, so that a state with a larger initial shock will experience larger increases in employment and a stronger recovery over time, but will remain weaker in terms of the level of employment relative to its pre-pandemic value than other states throughout the recovery.

b. Capturing the Distribution of Wage Shocks within Income Groups.

Because we are interested in accurately capturing the progressivity of each state's tax system and in accurately measuring unemployment benefits, we attempt to accurately measure the distribution of wage reductions across the population. We also attempt to properly quantify unemployment spells. A 10% unemployment rate for six months does not imply that 10% of the workers are unemployed for six months. Instead, there will be various spells of unemployment embedded in that unemployment rate—from very short spells to spells lasting the full six months. That is, people are becoming unemployed even as the unemployment rate is coming down, and many of the unemployed find jobs despite high unemployment rates. With progressive tax systems, more shorter spells may have different effects on income tax revenues than fewer longer spells. In addition, in order to calculate unemployment benefits, it is important to account for the fact that these benefits are time-limited, and thus more shorter spells will lead to higher unemployment benefits in the aggregate.

Our method for capturing these flows in and out of unemployment is as follows. For April through June, we use the national job finding rate out of unemployment from the BLS

Labor Force Status Flows data to determine how many of the previously unemployed have entered employment. The job finding rate is defined as the number of people employed next month who were unemployed the previous month, divided by the number of people unemployed the previous month. We then calculate the newly unemployed as the number of people who must become unemployed given the aggregate unemployment numbers by state derived above: Newly Unemployed = Total unemployed- Previously unemployed workers who remain unemployed[44]

From July on, we assume a constant job finding rate of 20%, about the rate expected given the level of unemployment. (See Appendix 3). Of course, in reality job finding rates likely depend on the duration of unemployment—with those with long spells of unemployment less likely to find a job, but we doubt that pinning those relationships down would have much effect on our results.

Thus, from the Opportunity Insight data, projected forward with the CBO projections, we calculate, for each group of workers (low, medium, and high income) a distribution of unemployment outcomes: no unemployment, unemployment for one month, unemployment for two months, etc.[45] We also track the date of unemployment spells so that we can appropriately adjust unemployment benefits for the temporary additional $600 benefit per week from the Pandemic Unemployment Compensation (PUC) program in the Cares Act.

c. Applying these shocks to the CPS

[44] Using national job finding rates creates some implausible results for states that experienced extremely rapid reductions in unemployment, like Alabama. In particular, the calculated value of "newly unemployed" may be negative, because the job finding rate was much higher than the national average. We address these cases by assuming a job finding rate that leaves the share of unemployed that are newly unemployed at a minimum of 10% (about the minimum value observed since the BLS flows data began).

[45] We follow unemployment spells for up to 18 months, at which point almost no one is still unemployed using our 20 percent job finding rate.

With these shocks in hand, it is straightforward to create a "shocked" CPS file to compare with the baseline. We first expand the data set using the CPS weights so that each respondent represents only one worker, sort the workers into groups based on the Opportunity Insights cutoffs, sort the workers within groups randomly, and then apply the shocks to the correct fraction of the population. For example, if our results indicate that, for the lowest income group in Minnesota, 70% experience no unemployment, 5% experience a 1-month unemployment spell, 10% experience a 2-month spell, etc., we simply lower wages in the baseline CPS to represent the # months of wages lost—e.g., workers with one month of unemployment lose $1/12^{th}$ of their wages. We do this separately for respondent and spouse wages (so the probabilities that both respondent and spouse lose their jobs are independent) and then group respondents by household. Apart from higher unemployment, we also take on board the lower wages (measured by the reduction in the level of the Employment Cost Index) that CBO has in their July projection relative to their January projection.

Calculating Unemployment Benefits

We use the unemployment benefits calculator in Ganong, Noel, and Vavra (2020) to calculate weekly unemployment insurance benefits by state. We assume that the unemployed can receive a maximum of 9 months (39 weeks) of benefits. For those unemployed in April, May, June, and July of 2020, we increase the unemployment benefit by $2600 per month (52/12*$600) to capture the PUC) benefits.[46]

Adjusting Proprietor income, dividends, interest income, capital gains.

[46] We assume a 100% take-up rate for unemployment benefits, which is likely to be too high, particularly after the additional $600 per week expired. On the other hand, we are not capturing benefits that the CARES act made available to self-employed workers and are not capturing the additional benefits that those who would have been unemployed absent COVID received. We estimate total UI benefit of $350 billion in 2020, which will likely be an underestimate of the total benefits paid during the year, indicating that our estimates of the tax losses from unemployment are likely to be a bit too high.

We use CBO economic projections to shock income, dividends, and business income (which includes income for sole proprietorships, S-corps, and partnerships) on a national basis, weighting their changes to proprietor's income, interest, and corporate profits (which include S-corps) by their weight in the Statistics of Income tax return data for 2018.[47] We use the change in CBO's July economic projection relative to its January 2020 projection to measure the impact of COVID. CBO has lowered their projection of nonwage income substantially. For example, dividends are down 8%, 24%, and 22% in 2020, 2021, and 2022, respectively, interest income is down 3%, 7%, and 11%, and proprietor's income—which is boosted by PPP payments in 2020—is down 6%., 11%, and 11%. Finally, we assume that taxable pensions (withdrawals from IRAs and DC pension plans) suffer ¼ of the reduction of dividends.[48] [49]

d. Projected Changes in Income Taxes

Table 4 provides our results of the effects of the pandemic on state and local personal income tax collections in 2020 and 2021. We find that the effects are moderate—on average. Income tax revenues decline 4.7% in 2020, 7.5% in 2021, and 7.7% in 2022, for totals of $22 billion, $37 billion, and $40 billion, respectively. These revenues losses are the result of losses in taxable income of 3.9%, 6.3%, and 6.4%, suggesting that state tax systems are moderately progressive.[50]

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[47] Table 1.3 here: https://www.irs.gov/statistics/soi-tax-stats-individual-income-tax-returns-publication-1304-complete-report#_pt1

[48] Much of the withdrawal from pension plans represent withdrawal of principal and minimum required distributions, so it shouldn't necessarily vary with asset returns. Examining historical data from the SOI, there seems to be some cyclicality of taxable pension withdrawals, but to a much lesser degree than dividends or other forms of asset income.

[49] In part, these reductions—as well as the reduction in wages noted above--represent sharp declines in inflation. Whether lower revenues from lower inflation represent a fiscal strain in the near-term depends on whether the prices of the things the state and local sector buys—mostly state and local employee wages—also decline.

[50] See Cooper, Lutz, and Palumbo (2015) for a discussion of state personal income tax progressivity.

These moderate declines—especially relative to the declines that would have been estimated using many of the regressions above—reflect the low incomes of most of the unemployed and the sizable taxable fiscal stimulus. Indeed, we calculate that, without the CARES Act, income tax revenues would have declined an additional $13 billion in 2020, $8 billion from unemployment insurance and $5 billion from PPP.[51] [52] Our estimates suggest that for every dollar of expanded UI, states collected 3.8 cents in revenue, lower than the average state tax rate because not all states tax unemployment benefits.[53]

There is a lot of variation across the states in the income tax revenue losses associated with COVID, driven by the variation in unemployment rates, the generosity in unemployment insurance benefits, and the important of non-wage income to the tax base. New Hampshire, California, New Jersey, and New York experience the largest 2020 percentage declines (New Hampshire only taxes capital income), with income taxes falling 9%, 8.5%, 8%, and 6.7%,

[51] While we assume a 100% take-up rate for unemployment insurance, which is surely somewhat too high, we also don't include the unemployment insurance received by those who didn't report wage income, many of whom would we covered by the PUA assistance, nor the effects of the additional $600 per week on those who would have been unemployed even in our pre-COVID baseline. Our estimate of the COVID related unemployment insurance benefits is $200 billion, whereas the CBO cost estimate of the UI portion of the CARES Act is $370 billion. Including an additional $170 billion in UI would lower our revenue losses by $6.6 billion.

[52] The amount of PPP money included in these estimates is quite minor—just about $x billion. Our method simply uses CBO's reduction in the growth rate of NIPA proprietor income—which includes their estimate of the effects of PPP— and applies it to CPS business income. Because the amount of proprietor's income in the NIPAs is far larger than that reported on tax returns or in the CPS, this method implicitly assumes that most of the PPP money will be untaxed. The Treasury estimated that much of the shortfall in proprietor income between the NIPAs and the tax data represents misreporting of income on the taxes. (Foertsch, 2016.) Because the federal government knows who received PPP loans, it is possible that a larger share will be taxed. On the other hand, to the extent that some business received loans and then ultimately went out of business, taxes on PPP may be lower than estimated here.

[53] As a back-of-the envelope check on the plausibility of these estimates, consider the following: total employment in the second quarter was 12% below that in the first quarter, yet total wages and salaries were only down 7%; furthermore, unemployment benefits in the second quarter fully offset the decline in wages. In the third quarter, those employment declines were 40% lower, and we assume the fourth quarters looks like the third. This gives an annual average decline of less than 4% for wages and salaries, and an annual average decline of just 2% in "wages + unemployment benefits." Adding in the one month of enhanced benefits in the third quarter and regular UI benefits brings this down to about 1.2%. Wages and salaries account for about 70% of taxable income (SOI data), so even with a roughly 8% drop in non-wage income, total taxable income for states that tax unemployment benefits would be down by only about 3% relative to January, and by about 4% relative to a pre-COVID baseline with employment growth.

respectively. In contrast, Illinois, Kansas Kentucky, and North Carolina, and West Virginia suffer declines of less than 1.5%.

These income tax calculations assume that there are no behavioral effects from COVID that would lead to lower income tax revenues. For example, perhaps misreporting of income increases in downturns, or tax-deductible expenses rise. In those cases, income taxes could decline more than we are estimating. On the other hand, the fact that the elasticity of state income taxes with respect to "taxable" personal income showed roughly unitary elasticities in most of the specification included on Table 3 suggests that these estimates are likely to be reasonable.

2. Calculating the Effects of COVID on Sales Tax Revenues

The sales tax is a large source of revenue for state and local governments. 46 states impose general sales taxes and, on average, these taxes account for about one quarter of state and local tax revenue. Most sales taxes are imposed by states, but some localities also impose their own sales tax on top of or in lieu of the state sales tax.

Because the sales tax is based on the dollar value of sales, sales tax revenues move proportionally with consumption of taxed items. But because of the unusual patterns of consumption changes during the current recession—large increases in groceries and large decline in spending at restaurants and hotels, for example, and because not all items of consumption are subject to the sales tax—looking at the past relationship between aggregate consumption expenditures and, particularly, unemployment and sales tax revenues may not yield a reasonable estimate of the effect of the pandemic on sales tax collections, at least in the near term.

To isolate some of these unique effects, we approximate changes in taxable consumption for each state by using a combination of changes in spending by consumption category from the

Opportunity Insights data, calibrated using national data for the second quarter from the NIPA, and state-by-state variation in the sales tax base.

a. The Tax Base

In very broad terms, the tax base for the sales tax is sales of goods plus sales of goods and services at drinking and eating establishments. States typically impose a sales tax on telecommunications services as well. Some items—like gasoline, alcohol, motor vehicles, and lodging—are sometimes subject to sales taxes and sometimes to special excise taxes, and often to both. Finally, some states exempt groceries or tax it at a lower rate and some exempt clothing, or exempt clothing items below a certain $ cap. We gather the rules for each state and then estimate spending changes by category due to the COVID pandemic. We use data on personal consumption expenditures in the NIPAs on a national basis to calculate categories of spending that are subject to the consumption tax. As shown in Table 5, 22 percent of NIPA household consumption spending is on items that are generally subject to the sales tax, and an additional 13 percent is on items that are sometimes subject to the sales tax.

We assume that the shares of total consumptions for the categories listed in column 2 of Table 5 are constant across states. Call s_i the share of spending on category i , t_{ij} the sales tax rate on category i in state j (equal to zero if an item is exempt) and a_{ij} the percent decline in spending in category i due to COVID in state j. Our estimate of the reduction in sales tax revenue due to COVID is then:

$$\text{Percent Sales Tax Revenue Loss in state } j = \frac{\sum_i t_{ij} s_{ij} a_{ij}}{\sum_i t_{ij} s_{ij}}$$

b. Calculating the Change in Spending by Spending Category

We use a variety of source to calculate the changes in consumption due to COVID. For spending on restaurants and hotels, apparel, and grocery stores, we rely on the data from Opportunity Insights, which partnered with credit-card processor Affinity to track changes in daily spending by state relative to January of 2020.[54] The data are constantly updated and now go through the beginning of September. The data are also roughly adjusted for seasonal variation. For gasoline sales, we use the change in miles driven in each state provided by the Department of Transportation, which we have through June, plus the change in national gas prices. We use state-by-state regressions of miles driven on time spent away from home, as measured in the google mobility data (also provided by Opportunity Insights), which have R-squareds ranging from 73% to 99%, to extend our estimates of miles driven by state through September. For motor vehicle sales, we only have national data on seasonally-adjusted vehicle sales by month which we use for all states.[55] Car sales plunged in March and April—April seasonally adjusted sales were down almost by 50% from January—but have recovered since then. At the beginning of August, however, they remained 10% below January's level. We assume that sales tax collections in all other categories of consumer spending were initially unaffected by the pandemic, as suggested by the data in Table 6.

c. Projecting tax revenues forward

The unusual pattern of consumption declines observed since the start of the pandemic—the plunge in car sales, driving, and hotel occupancy, for example— likely reflects the effects of

[54] We can't distinguish between restaurants and hotels in the OI data, but this distinction is important because hotels fell much more than restaurants in the NIPA data and not all states subject lodging to sales taxes. In the aggregate, food and accommodations services were 40% lower in the second quarter than in the fourth quarter of 2019, with food services 33% lower and accommodations 76% lower. As a rough estimate, we multiply the state-level Opportunity Insights estimate for the decline in food and accommodation services by about 2 (76/40) to estimate the decline in accommodation spending and by about ¾ (33/40) to estimate the decline in food services. We use the decline in spending for apparel and general merchandise for apparel spending.

[55] Data are at https://fred.stlouisfed.org/series/TOTALSA.

social distancing much more than the effects of lower income and underlying demand. The CBO projection assumes a gradual easing of social distancing that subsides fully by the middle of 2021. After that, the economy slowly recovers, no longer held down by social distancing but by the damage done to the economy during the pandemic.

Our projections of sales tax revenues take the easing of social distancing into account. In particular, we assume that the shock to spending (the change in spending relative to its pre-COVID baseline) abates over time. By the middle of 2021, we assume that the shock to consumption no longer reflects social distancing but instead, only reflects the overall state of the economy.

To gauge that shock, we again use the change in the CBO projection between January and July of 2020. CBO's July projection of 2021 Q3 nominal consumption is 9.4% below what they had written down in January. Thus, we assume that all consumption—including consumption that has not shown signs of declining yet—is 9.4% below its pre-COVID baseline by the third quarter of next year. After that, consumption rises in step with CBO's aggregate consumption. However, with low inflation, CBO does not have much of a recovery in nominal consumption between mid-2021 and the end of 2022.

To calculate the tax losses in dollars, we multiply our projected declines by a counterfactual sales tax baseline, which is calculated as the total sales taxes collected by state and local governments from the 2017 Census of Governments, increased to 2020 levels using the average growth rate in national state and local sales tax collections from the NIPAs between 2018 and 2019.

Table 7 shows our results for the nation over the next three years. In aggregate, we project that sales taxes will decline $49 billion this year, $45 billion next year, and $46 billion in

2022. As discussed above, part of this decline reflects the fact that CBO has lowered the price level substantially as a result of COVID. Examining constant "pre-COVID" dollars, the declines are somewhat smaller, $44 billion, $34 billion, and $32 billion. Looking across the states, the largest percentage declines are in the District of Columbia (18%) and Rhode Island. (16%) while the smallest declines are in Alabama, Idaho, and Arkansas (4%, 5%, and 6%).

These projections may be somewhat too pessimistic. While we assume that the effects of social distancing wane, we do not account for the possibility that some of the lost spending will be made up. It seems likely that at least some of the cars not purchased and trips not taken represent consumption delayed rather than foregone, especially given the large rise in the personal savings since the pandemic began. Furthermore, the CBO recovery in consumption is very muted and may also be somewhat too pessimistic. For example, real consumption in 2020 Q2 in CBO's July projection was 13% below what CBO had written down in January. By the end of 2022, it remains 6% below, meaning that only 45% of the shock has dissipated.

3. Calculating the Effects of COVID on Corporate Taxes

While corporate tax collections make up only a small part of state and local revenues, they are also highly procyclical, and the large declines in federal corporate tax collections in the CBO forecast suggests that the revenue declines for state and local governments are likely to be substantial. CBO has adjusted its estimates of corporate tax receipts down because overall corporate profits are down, because the taxable share of profits tends to decline in recessions, and because of legislative changes made in the CARES Act. We adjust the July CBO projections to take out the legislative effects, as these are unlikely to affect state tax collections.[56] We then

[56] The largest legislative change affecting corporate profits involved an adjustment to how net operating losses (NOLs) are treated. Most states do not automatically adhere to changes in NOL treatment made at the federal level (Ernst and Young 2020).

calculate the COVID shock to corporate tax collections as the difference between this adjusted July projection and the January CBO projection and apply this percentage shock to our estimate of what state corporate tax revenues would have been in the absence of COVID. We calculate these counterfactual state corporate receipts using the 2017 Census of Governments, increased by the average growth rate of such taxes between 2014 to 2017.

We project that state corporate tax collections will decline $2 billion in 2020, $29 billion in 2021, and $14 billion in 2022. Our projections of state-by-state corporate tax collections are in Appendix Table 1.

4. Calculating the Effects of COVID on Other Taxes and Fees

State and local governments derive significant revenue from sources other than the individual income tax, corporate income tax, property tax, and sales tax. Taxes other than these major four – which we refer to as "other taxes" – totaled nearly $300 billion in FY2017, accounting for around 12 percent of own source general revenues. The largest of these "other" taxes is the motor fuel tax. The states and localities also generate substantial income from fees and other sources. Fees accounted for $526 billion in revenue in FY2017, equal to 22 percent of own source general revenues. The most significant sources of fees are charges for higher education and public hospitals. Finally, miscellaneous revenue sources equaled $230 billion in FY2018, accounting for 10 percent of own source general revenues. The largest of these is interest income accruing from the sector's substantial asset holdings.

We use an approach similar to that developed in Whitaker (2020a, b) to estimate the revenue declines attributable to other taxes, fees, and miscellaneous sources. In particular, we assign each individual revenue source a tax base measured at the monthly frequency. These are generally components of household consumption found on NIPA table 2.4.5U. For instance,

higher education fees are assigned a base of consumption of proprietary & public higher education services. A list of the revenue sources, and their associated bases, can be found on Appendix Table 2. For most categories of spending, we do not have state-specific information, and simply assume that the declines in the tax bases in the NIPA are uniform across the states. The exceptions to this are for our estimates of motor fuel tax collections and hospital fees. For motor fuel taxes, we use the method discussed above in the sales tax section to use state-specific projections of miles driven. We apply a similar procedure for hospital fees using the OI data on consumer health care spending.

To calculate the COVID shock, we first estimate a counterfactual no-COVID tax base by simply growing the tax base out by its average growth rate over 2018 and 2019. The tax base under COVID is simply the actual value through its latest available month (typically June).[57] We then project this COVID tax base forward. In doing so, we distinguish between revenues that we judge have been directly and significantly affected by social distancing and those that have not. Taxes and fees related to health care, amusement and gambling, and transportation are assumed to be depressed now because of social distancing. For these revenue sources, we follow the same procedure as described above for sales taxes: we assume that these tax bases rise fairly rapidly over the next few quarters, as the effects of social distancing abate, so that they are just 9.4% below the pre-COVID baselines by the middle of the next year, the same as CBO's projection of PCE, and then recover at the same pace as CBO's PCE shock. For the other sources of revenues, we assume that they recover from their current "shock" at the same pace as CBO's projection of PCE. With COVID and no-COVID tax base projections in hand, we simply grow out tax

[57] For motor fuel taxes and hospital fees, the COVID tax base is defined by applying the percent decline in miles driven or consumer health care spending, measured relative to January, to the counterfactual tax base.

collections by the growth in these two tax bases and then take the difference as our measure of the COVID revenue shock in dollars.[58]

Table 8 shows our results for the nation. Appendix Tables 3 and 4 show our results for each state. We estimate that the pandemic will lower revenues from "other taxes" and fees, excluding fees to public hospitals and institution of higher education, by $82 billion this year, $55 billion next year, and $45 billion in 2022. The largest source—by far—is related to transportation, accounting for $46 billion in tax losses this year. This big hit to taxes and fees on transportation represents a massive difference from prior recessions.

We estimate that the pandemic will lower fees to public hospitals and institutions of higher education by $33 billion this year, $22 billion in 2021, and $22 billion in 2022. It is difficult to assess the extent to which the projected declines in these fees should be included in our measures of revenue losses, because these fees are typically provided in exchange for services rendered. As fees decline, so too do services, and, possibly, expenditures. For example, the sharp decline in health expenditures in the spring meant that health care facility revenues plunged. To the extent that public hospitals laid off workers, reduced hiring and hours, or cut back on supplies, these revenue losses were likely offset by declines in spending. On the other hand, running a hospital involves significant fixed costs, so the decline in revenues was likely not fully offset.[59]

Furthermore, while reductions in revenues offset by reductions in expenditures do have macroeconomic implications, they are the product of social distancing rather than tight budgets.

[58] Taxes and fees are extrapolated from the 2017 Census of Governments through 2019 by simply applying the average growth rate of the tax base over 2018 and 2019.

[59] Of course, it is possible that much of the lost revenue will be made up in the future as people ultimately get their conditions treated, a possibility we do not include in our projections.

Providing aid to state and local governments would not boost these expenditures. Furthermore, unlike declines in revenues that are not offset by declines in spending, they don't require any *further* changes in state and local spending beyond those already observed. Of course, some of these same dynamics apply to non-fee-based services. For example, employment in local education declined about 5 percent in the spring. While some of these declines might have been in anticipation of tight budgets ahead, they also likely reflected, at least in part, layoffs of bus drivers, cafeteria workers, and other workers not needed for online schooling. From that perspective, these layoffs—while a negative for the macroeconomy, the workers, and the students—might be viewed as loosening budget constraints rather than as reflecting tight ones.

Finally, we do not account for miscellaneous revenues in this section. We assume that all non-interest components of miscellaneous revenue – e.g. property sales and special assessments – are unaffected by COVID. We address interest earnings below.

5. Accounting for Federal Aid to State and Local Governments

As noted above, states and localities are due to receive over $200 billion in federal aid this year. The largest portion of that aid is $150 billion through the Coronavirus Relief Fund. Although those funds are required to be used for COVID-related spending that was not anticipated in the prior's year budget—a provision that initially led to concerns that not all the money could be spent— the states have now mostly appropriated these funds, indicating they are likely to be spent (Gordon, Dadayan, and Rueben 2020). The Cares Act also provided $25 billion in aid to public transit agencies, $13 billion to K-12 education, and roughly $6.5 billion to public colleges and universities.[60] Finally, the CARES Act also included $175 billion in aid to

[60] The aid to public universities was part of a broader package of aid to overall higher education. The allocations by university can be found at https://www2.ed.gov/about/offices/list/ope/allocationsforsection18004a1ofcaresact.pdf, and the identification of higher education institutions as public can be found here: https://sites.ed.gov/naciqi/files/2018/05/Institutional-Performance-by-Accreditor_2018-05-02.xlsx .

health care providers, $35 billion of which we estimate will go to public hospitals and community health centers.[61]

In addition, the Families First Coronavirus Response Act raised the federal share of Medicaid spending (the FMAP) by 6.2 percentage points for the duration of the public health emergency. That increase in the FMAP appears to be more than enough to fund the higher Medicaid expenditures expected as a result of the pandemic, leaving about $24 billion of flexible funding in 2020, $19 billion in 2021 and $9 billion 2022.[62] [63]

Table 8 provides a summary of the effects of the pandemic on the near-term state and local budget outlook. At least for 2020, federal aid seems large enough to offset the revenue losses state and local governments are likely to experience. Looking forward, however, should the economy remain below its pre-COVID baseline for many years, as the CBO projections suggest, these governments will need additional aid in order to avoid cutting back on services or raising taxes and impeding the recovery.

[61] This estimate is based on the BEA's breakdown of provider spending in the second quarter, summarized here: Of the $80 billion provided to health providers in the second quarter, $50 billion went to non-profit hospitals, $30 billion was categorized as subsidies to for-profit hospitals, and $20 billion was classified as a grant to state and local governments. Thus, we assume that 20% of $175 billion in aid to health providers included in the CARES Act will accrue to state and local governments. https://www.bea.gov/sites/default/files/2020-08/effects-of-selected-federal-pandemic-response-programs-on-federal-government-receipts-expenditures-and-saving-2020q2-second.pdf.

[62] While CBO only projects federal Medicaid spending, we can use the revised FMAP to back out what it is projecting for overall Medicaid spending and to calculate the state share, and compare that to the pre-COVID Medicaid expenditures using the pre-COVID FMAP. That calculation requires knowing how long the public health emergency will last. While CBO has not included a specific end date for the public health emergency in its most recent budget outlook, it has noted that the public health emergency will continue at least through part of 2022. We have assumed that the emergency is declared over in June of 2022. We also assume that the percentage increase in Medicaid spending due to the pandemic is the same in each state.

[63] We include the net revenues available from the higher FMAP in our aid figures, recognizing that this is somewhat inconsistent with the way we have treated other aid. For example, the Coronavirus relief fund was also intended to cover higher expenditures due to COVID. Because we do have a good idea of the magnitude of the additional Medicaid spending, but don't have any information on the magnitude of other COVD-related spending, we have chosen to treat the two categories of aid differently.

Furthermore, even if state and local governments are not cutting back on spending in the aggregate, so that they are not a net drag on the economy, changes in the need for spending brought on by the pandemic could still mean that these governments face tough budget choices and might have to cut back on essential services. For example, if providing decent virtual education requires hiring more staff and providing equipment to students, or if demand for mental health services or services for the elderly rise as a result of the pandemic, then the ability to simply maintain pre-COVID levels of spending may not be enough. A complete analysis of the fiscal conditions of state and local governments requires knowing much more about the spending side of the budget than we do at this point.

Furthermore, just because federal aid appears sufficient in the near term in aggregate does not mean that it is sufficient for every state. Federal aid to states is not fungible across states lines. Tables 9 and 10 examines the degree of fiscal stress on a state by state basis. Table 9 shows our estimates of the total decline in revenues (personal income, corporate income, sales tax, and other taxes and fees, excluding those to public hospitals and institutions of higher education) as a share of general own source revenue. There is a great deal of variation across the states. States like Nevada, Washington, California, Florida, and New York show the largest declines in 2020, while states like Kansas, New Hampshire, Mississippi, and Wyoming show the smallest.

There is also a great deal of variation in the amount of aid received. Table 10 shows federal aid as a share of own-source general revenues for each state. While the largest source of federal aid—the $150 billion Coronavirus relief fund, is generally distributed on the basis of population, states received a minimum of $1.25 billion. That made the aid exceedingly generous for some states, while others are likely to face budget shortfalls even in the absence of significant

increases in COVID-related spending. For instance, Vermont received aid (other than for hospitals and higher education) equal to 23 percent of its general own source revenues; in contrast New York, which was much harder hit by the pandemic, received only 6 percent.

Finally, in addition to the fiscal support, the Federal Reserve has established the Municipal Liquidity Facility (MLF). The MLF, which was established in response to unprecedented dysfunction in the municipal bond market following the onset of the pandemic, aims to ease the cash flow pressures on state and local governments by purchasing short term muni debt. Although the MLF has only purchased two loans totaling about $1½ billion, the facility likely contributed to a significant easing of conditions in the muni market. Indeed, many states and localities can now borrow at interest rates which are at, or near, historic lows.[64]

D. The fiscal outlook for state and local governments in the medium term

Because state and most local governments have to roughly balance their operating budgets, near-term fiscal distress should mostly be accompanied by near-term cutbacks in spending and reductions in spending, although, as we say in the Great Recession, severe near-term fiscal distress can linger on as states pay down any debt and rebuild their rainy day funds.[65] The pandemic will also affect some sources of revenue that are not subject to balanced budget requirements—in particular, spending on unemployment insurance, interest costs on state and local debt, and asset returns on state and local pensions

1. Effects of COVID on State Unemployment Insurance Financing

[64] See Hiteshew (2020) for an overview of the MLF. Gordon, Dadayan, and Rueben (2020) also provide and an overview, including a discussion of criticisms of the facility – e.g. calls to expand the MLF's scope in terms of eligible issuers and eligible types of bonds.

[65] The stringency of the balanced budget requirements varies considerably across the states, with some states only having to submit balanced budgets, while others are required to enact mid-year increases in taxes and fees or cuts in spending to offset unexpected deficits. See Rueben and Randall (2017) for a discussion.

State unemployment insurance (UI) programs are funded jointly by the federal and state governments through an employer-side payroll tax. States apply experience rating such that employers with a higher share of past layoffs pay a higher tax rate. Moreover, in most states, UI tax rate schedules are automatically increased when the trust fund becomes depleted. Finally, state UI taxes are deposited in a state-specific trust fund at the U.S. Treasury and used to pay UI benefits in that state. If the trust funds become insolvent, states may borrow from the U.S. Treasury to cover the shortfall.[66]

The UI program is typically viewed as an automatic stabilizer which buffers the economic cycle by increasing benefit payments as the economy slows. However, the financing of the program may hamper its ability to act as a buffer; in particular, concerns have been expressed that increases in UI tax schedules due to depletion of trust funds may impede labor market recovery (e.g. Duggan and Johnston 2020) and the need to replenish trust funds may divert resources from other uses in already strained state budgets. Indeed, following the Great Recession most UI trust funds became insolvent and average UI tax rates rose.

Nevertheless, the effects of UI financing strains seem likely to be moderate in terms of both state budgets and with regards to their macroeconomic effects via tax rates. In terms of UI employer tax increases, the various expanded UI benefits are not subject to experience rating and hence will not trigger increased tax rates. In addition, as of May 11, over half the states had exempted at least some current UI benefit charges from experience rating (Loughead 2020). Moreover, although UI tax rates increased significantly in percentage terms in the aftermath of the Great Recession and some firms and industries experienced large increases, in aggregate the

[66] Vroman and Woodbury (2014) provide an excellent overview of UI financing in general and in the aftermath of the Great Recession.

average tax rate was only 0.6% of payroll in 2008 and rose to only 0.9% in 2012 before falling back.[67]

In terms of state budget strain, states may borrow to address UI financing shortfalls; as a result, they can adjust to the shock gradually over many years, as opposed to the much quicker adjustment necessitated by general revenue shortfalls. Indeed, following the Great Recession, states in aggregate eliminated their UI debt very slowly, only extinguishing it in 2019 (U.S. DOL, 2014, 2020). Trust funds were in substantially better shape prior to the pandemic than prior to the Great Recession. Nevertheless, 16 trust funds—including the trust funds of many of the largest states—have become insolvent in the wake of the pandemic; these states have already borrowed nearly $30 billion from the federal government to continue to fund benefits.[68] If these loans are not repaid within roughly three years, state employers face increased federal UI taxes and above-market interest rates are assessed on the loan balance. To avoid these penalties following the Great Recession, a number of states issued private-market debt and used the proceeds to repay the federal loans.[69] With interest rates historically low, states will again have a strong incentive to roll over their UI trust fund debt.[70]

2. Effects of Lower Interest Rates on State and Local Finances

State governments are both borrowers and savers. The saving is mostly in the form of contributions to state and local employee pension funds, while the borrowing is through the

[67] See https://www.bls.gov/opub/mlr/2020/article/the-cost-of-layoffs-in-ui-taxes.htm. In dollar terms, state UI taxes rose from about $30 billion in 2008 to about $50 billion in 2012. See https://oui.doleta.gov/unemploy/hb394/hndbkrpt.asp.

[68] https://oui.doleta.gov/unemploy/budget.asp

[69] By 2015, about half of outstanding UI trust fund debt was privately held; by 2016 a large majority was privately held.

[70] See Lachowska, Vroman, and Woodbury (2020) for a discussion of state UI trust fund positions on the eve of the pandemic and analysis of the factors that determine the speed at which the trust funds recover from economic downturns.

issuance of municipal debt—mostly to finance long-term capital projects. According to the Census of Governments for 2017, total state and local government debt equaled $3 trillion in 2017, while total financial assets were $6.9 trillion. Thus, on net, state and local governments are net lenders rather than borrowers; this was true not just for the U.S. as a whole, but for each state individually as well.

To a first approximation, the immediate fiscal pressures coming from lower interest rates can be calculated as the change in rates of return multiplied by net financial assets, assuming that changes in Treasury rates are passed on one-for-one to changes in rates of return on other assets. This calculation ignores the fact that not all debt and financial assets roll over immediately but should nevertheless give a reasonable measure of the near-term fiscal effects of lower rates of return. As noted above, CBO lowered their projection of rates on Treasuries by about 1.1 percentage points in 2020, 1.4 percentage points in 2021, and 1.6 percentage points in 2022. In the aggregate, we estimate that the lower real interest rates lower funds available to state and local governments by roughly $45 billion in 2020, $55 billion in 2021, and $65 billion in 2022.

Looking beyond the near term, a longer-term decline in interest rates—perhaps what the market expects, but not what is included in the CBO projection—would place additional stress on state and local employee pension funds. But, as argued by Lenney, Lutz, Schuele, and Sheiner (2020)—negative real interest rates not only increase the rate of contributions needed to close existing pension funding gaps; they also make the case for pre-funding pensions weaker. Lenney et al. note that when valuing the liabilities at risk-free rates, these plans have always been less than fully funded, and thus state and local governments have long been carrying implicit debt. Lower interest rates lessen the value of pre-funding.

Furthermore, recognizing that not-fully funding pension contributions is a form of borrowing, it is worth asking how much flexibility state and local governments have to use such borrowing to weather the current crisis and whether lowering contributions provides much fiscal space. For the U.S. as a whole, state and local contributions to employer pensions totaled $169 billion. Budget Balances (rainy day funds plus general fund surpluses) at end of 2019, while at a record high of $119 billion, can only be used once—whereas contributions can be cut for multiple years. Furthermore, while budget balances were at record high for the country as a whole, not all states were in such a good position. Yet, as shown in figure 12, many states without much in reserves do make sizable pension contributions, which could provide them some fiscal space if needed. Thus, cutting back on pension contributions could go some distance toward mitigating spending cuts. However, cutting back on pension funding comes at the cost of makes pension commitments less sustainable over medium and longer terms. Moreover, higher grants from the federal government would be a more efficient way of smoothing through the costs of the pandemic: the federal government is better able to bear debt, has lower borrowing costs, and can internalize the economic spillovers arising from the macroeconomic effects of higher state and local spending.

IV. Conclusion

The COVID-19 pandemic has had the biggest effect on the economy, at least in the short run, of any downturn since the Great Depression. The policies undertaken to deal with the crisis will have important implications for the length of the recession and the strength of the recovery. The pandemic will also affect the conduct of fiscal policy once the crisis is past, given the projection of rising debt, the long-lasting effects on the economy, and the effects of the crisis on U.S. political imperatives.

Appendix 1: The Fiscal Gap

The fiscal gap, say Δ, is given by:

$$\Delta = \frac{b_t - \left(\frac{1+g}{1+r}\right)^{(T-t)} b_T + \sum_{s=t+1}^{T} \left(\frac{1+g}{1+r}\right)^{(s-t)} d_s}{\sum_{s=t+1}^{T} \left(\frac{1+g}{1+r}\right)^{(s-t)}} \quad (1)$$

where g is the GDP growth rate, r is the government interest rate (both assumed to be constant), d_s is the primary deficit as a share of GDP in year s, b_t is the initial debt-GDP ratio, and b_T is the terminal target debt-GDP ratio.

To consider the impact of low interest rates on the size of the fiscal gap, it is useful to decompose the gap into three components, each divided by the denominator, based on terms in the numerator of expression (1): the present value of primary deficits, $\sum_{s=t+1}^{T} \left(\frac{1+g}{1+r}\right)^{(s-t)} d_s$; the debt service needed to maintain the initial debt-GDP ratio, $b_t \left[1 - \left(\frac{1+g}{1+r}\right)^{(T-t)}\right]$; and the resources needed to reduce the terminal debt-GDP ratio below the initial debt-GDP ratio, $\left(\frac{1+g}{1+r}\right)^{(T-t)} (b_t - b_T)$. Unless $r > g$, the debt service term does not increase the fiscal gap – maintaining the initial debt-GDP ratio requires no resources, because growth is at least sufficient to do so. Indeed, for $r < g$, maintaining the existing debt-GDP ratio reduces the fiscal gap. However, reducing the debt-GDP ratio over time requires more resources, the lower is r, because putting resources aside each year to accomplish this target benefits less from accruing interest.[71] Finally, the impact of a lower value of r on the third component of the fiscal gap, $\sum_{s=t+1}^{T} \left(\frac{1+g}{1+r}\right)^{(s-t)} d_s \Big/ \sum_{s=t+1}^{T} \left(\frac{1+g}{1+r}\right)^{(s-t)}$, depends on whether primary deficits are generally rising or falling over time

[71] That is, the term $\left(\frac{1+g}{1+r}\right)^{(T-t)} (b_t - b_T) / \sum_{s=t+1}^{T} \left(\frac{1+g}{1+r}\right)^{(s-t)} = (b_t - b_T) / \sum_{s=t+1}^{T} \left(\frac{1+g}{1+r}\right)^{(s-T)}$ is decreasing with respect to r.

as a share of GDP. For example, if d_s is constant, this third component simply equals that constant primary deficit-GDP ratio and does not depend on r. In the current situation, where primary deficits are projected to rise over time as a share of GDP, lower interest rates increase the fiscal gap, because closing the gap implies accumulating primary surpluses in order to help cover primary deficits later on; lower interest rates increase the resources needed to do so.

Appendix 2: Validating and Calibrating Taxsim/CPS Results

As a check on the ability of Taxsim and the CPS to calculate state taxes, we compare our estimates of tax revenues with actual tax collections by state from the BEA. In aggregate, our estimates are fairly accurate. For the nation as a whole, we estimate total state income tax revenues in 2018 of $364 billion, relative to actual collections of $394—a miss of about 8 percent. The estimates by state contain more error but remain reasonably accurate. Appendix Figure 1 compares our estimates of per capita tax collections by state against actual revenues. (The per capita normalization facilitates comparison of states of different sizes.) Appendix Figure 2 shows these results in a slightly different way—examining the ratio of Taxsim revenues to BEA revenues across the states.

These results led us to omit Tennessee and North Dakota from our income tax analysis, as our Taxsim estimation technique is unable to accurately model the income taxes in these states. Tennessee only taxes interest and dividend income, and that tax is being phased out. (It is just 1% in 2020 and will be repealed by 2021.) And even with 3 years of the CPS, the sample size for North Dakota appears too small to adequately capture state income tax collections.

But even dropping these 2 states, the estimates are not as accurate as the national one. For the richer states, using Taxsim with the CPS understates tax collections, whereas for lower-income states, it overstates it. We suspect this result is due, at least in part, to the Census method of "rank proximity swapping" where, in order to preserve privacy, the Census swaps income above some threshold across respondents across states. Thus, some very high incomes for respondents living in California, for example, may appear as high incomes of respondents living in South Carolina, lowering California's estimated tax collections and raising South Carolina's.

Still, a regression of our estimated per-capita tax collections by state on BEA's per-capita tax collections, shown below, is reassuring – e.g. the R-squared is .085 and the coefficient on BEA tax collections is .9.

To correct these errors in our Taxsim modeling, we perform the following crude adjustment. We adjust the weights on individuals with income above $250,000 so as to match the BEA baseline collections, and then use these adjusted weights on our COVID estimates. The $250,000 is chosen to be representative of the type of household that might be subject to a swap—unfortunately the cutoffs are income specific—with alimony greater than $30,000 subject to a swap but wage greater than $300,000, so there is no easy way to reweight.

Appendix 3: Choosing the Job Finding Rate

As shown in Appendix Figure 3, the job finding rates so far in this recession have been extraordinarily high. We expect job finding to continue to trend down over time and think using a constant 20% rate given the unemployment rates CBO projects over the next three years is reasonable.

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Table 1. Fiscal Gap (% GDP)						
	Current Law			Current Policy		
Target	Begin 2021	Begin 2025	Begin 2030	Begin 2021	Begin 2025	Begin 2030
Debt = current	3.19	3.54	4.24	4.23	4.74	5.73
NI = 3.2	3.79	4.21	5.06	4.81	5.40	6.55

Table 2
Summary of Recent Projections for Revenue Losses From COVID in the State and Local Sector

Authors	Revenue or Spending	Revenue Losses FY2020 + FY2021 (billions)	Economic Forecast Underlying Estimate	Methodology
Bartik (May 2020) Upjohn Institute	State and Local Taxes	$875	April CBO.	Historical relationship augmented for assumed local revenue effect. 1% increase in unemployment lower state and local revenues by $60 billion.
McNichol, Leachman, and Marshall, 2020, Center on Budget and Policy Priorities	State Taxes	$395	April CBO.	Historical relationship: 1% increase in unemployment rate lowers revenues 3.7%
Bivens and Walker (April 2020) Economic Policy Institute	State and Local Taxes	$345	Goldman Sachs forecast April.	Historical relationship augmented for assumed local revenue effect. A 1% increase in unemployment associated with a $60 billion decline in state and local revenues.
Clemens and Veuger (June 2020)	State Income and Sales Tax	$148	April CBO.	Historical relationship : 1% decline in personal income lowers revenues by 1.6%.
White, Crane and Seitz (April 2020) Moody's Analytics	State Revenues General Funds	$130 baseline $203 more severe scenario	Baseline: Max 10% decline real GDP, gradual recovery. More severe: Max 14% decline real GDP, gradual recovery.	Proprietary model that includes state-by-state regressions of state revenues on economic revenues.
Whitaker (June 2020)	All State and Local Revenue (including fees, charges, etc.)	$200 -$490	Best: Recovery complete by 2020 Q4. Worst: Second wave shutdown 2020 Q4 . Economy recovered by Q4 2021.	For income taxes: estimate wage declines and assume tax revenues decline proportionally. For sales taxes, use national changes in portions of PCE likely subject to sales tax.
Dadayan (July 2020) Urban Institute Tax Policy Center	State Taxes	$200	States forecasts.	Estimated for all 50 states based on forecast data from 27 states.

Table 3: State and Local Tax Revenues and the Business Cycle, 1985-2019					
		Dependent Variable: Log Change in Real per Capita State and Local Income Taxes			
Independent Variable		All	Exclude 2009	Include Stocks	Include Stocks and Exclude 2009
Change in UR	Coeff.	-4.9	-3.5	-3.3	-2.7
	Rsq Adj.	0.56	0.24	0.65	0.35
Log change real per cap personal income	Coeff.	2	1.4	1.4	1.1
	Rsq Adj.	0.58	0.28	0.65	0.36
Log change real per cap "taxable" personal income	Coeff.	1.5	1.06	1.06	0.89
	Rsq Adj.	0.61	0.32	0.67	0.4
		Dependent Variable: Log Change in Real per Capita State and Local Sales Taxes			
Change in UR	Coeff.	-3	-2.3	-2.4	-2
	Rsq Adj.	0.72	0.44	0.75	0.49
Log change real per cap personal income	Coeff.	1.1	0.7	0.8	0.6
	Rsq Adj.	0.6	0.27	0.64	0.31

Table 4
Projected Declines in State and Local Personal Income Tax Revenues

	2020	2021	2022		2020	2021	2022
AL	-5%	-6%	-7%	MT	-6%	-6%	-7%
AK				NE	-2%	-6%	-7%
AZ	-2%	-5%	-6%	NV			
AR	-3%	-7%	-8%	NH	-9%	-28%	-26%
CA	-9%	-10%	-10%	NJ	-8%	-8%	-8%
CO	-2%	-5%	-5%	NM	-2%	-5%	-6%
CT	-3%	-6%	-7%	NY	-7%	-11%	-10%
DE	-5%	-8%	-8%	NC	-1%	-5%	-5%
DC				ND	-5%	-11%	-10%
FL				OH	-2%	-5%	-5%
GA	-2%	-5%	-6%	OK	-2%	-6%	-7%
HI	-4%	-13%	-11%	OR	-3%	-7%	-7%
ID	-2%	-5%	-6%	PA	-6%	-5%	-5%
IL	0%	-4%	-4%	RI	-3%	-6%	-7%
IN	-2%	-4%	-4%	SC	-2%	-5%	-4%
IA	-3%	-7%	-8%	SD			
KS	-1%	-4%	-5%	TN			
KY	-1%	-4%	-5%	TX			
LA	-2%	-6%	-5%	UT	-3%	-5%	-6%
ME	-3%	-7%	-7%	VT	-5%	-11%	-10%
MD	-3%	-6%	-6%	VA	-6%	-7%	-7%
MA	-3%	-7%	-7%	WA			
MI	-2%	-7%	-7%	WV	-1%	-6%	-6%
MN	-4%	-8%	-9%	WI	-2%	-6%	-7%
MS	-3%	-6%	-7%	WY			
MO	-2%	-5%	-6%				
Total	**-4.7%**	**-7.5%**	**-7.7%**				
Total $ (billions)	**-$22**	**-$37**	**-$40**				

Table 5
State Sales Tax Bases

	Nominal $ 2019 Q4 (billions)	Share of PCE	2020 Q2 Level Relative to Q4 of 2019
Usually Subject to Sales Tax			
Motor vehicles and parts	528	3.6%	-8%
Food services (Restaurants)	853	5.8%	-33%
Other durable and nondurable goods (excluding prescription drugs) and telecommunication services	1857	12.6%	-1%
Sometimes Subject to Sales Tax			
Accommodations	159	1.1%	-76%
Gasoline and other energy goods	340	2.3%	-44%
Clothing and footwear	405	2.7%	-29%
Food and beverages for off-premises consumption (Groceries)	1032	7.0%	10%
Rarely Subject to Sales Tax			
Other Services	8585	58.2%	-16%
Consumption of nonprofits	438	3.0%	54%
Pharmaceuticals and other medical products	562	3.8%	1%
Total	**$14,759**	**100.0%**	**-11.8%**

Table 6
Other Taxes and Fees

	Covid-19 Declines (billons of $)			2017 Collections	
	2020	2021	2022	Billions of $	Percent
Other Taxes and Fees Excluding Public Hospitals and Higher Ed					
Transportation *Gas tax, Airport fees, Highway Tolls, Motor Vehicle Licence fees, Parking, Water Transport*	46.4	23.1	14.8	131.1	19%
Severance Taxes, Natural Resources, and all other NEC fees	9.5	10.2	10.2	82.6	12%
Parks & Recreation, Amusement and Parimutuels Tax	9.0	4.0	2.3	20.3	3%
Sewerage, Solid Waste, Housing & Comm Devel, Public Utility Taxes	9.0	-0.7	-0.7	27.1	4%
Alcohol and Tobacco Tax and Licenses	0.5	0.6	0.6	27.2	4%
All other NEC	7	18	18	408	59%
Total	**$82**	**$55**	**$45**	$697	100%
Public Hospitals and Higher Ed					
Hospitals	29	18	18	160.0	
Higher Education	3	4	4	129	
Total	**$33**	**$22**	**$22**	**289**	

Table 7
Projected Declines in General Sales Tax Revenues

	2020	2021	2022		2020	2021	2022
AL	-4%	-8%	-9%	MT			
AK	-13%	-11%	-11%	NE	-9%	-9%	-9%
AZ	-11%	-9%	-9%	NV	-11%	-9%	-9%
AR	-6%	-8%	-9%	NH			
CA	-12%	-10%	-9%	NJ	-12%	-10%	-9%
CO	-13%	-10%	-9%	NM	-14%	-10%	-9%
CT	-12%	-10%	-9%	NY	-15%	-11%	-11%
DE				NC	-13%	-10%	-9%
DC	-18%	-11%	-9%	ND	-10%	-9%	-9%
FL	-11%	-9%	-9%	OH	-9%	-9%	-9%
GA	-10%	-9%	-9%	OK	-5%	-8%	-9%
HI	-7%	-10%	-10%	OR			
ID	-5%	-8%	-9%	PA	-9%	-9%	-9%
IL	-13%	-11%	-10%	RI	-16%	-11%	-9%
IN	-13%	-11%	-10%	SC	-9%	-9%	-9%
IA	-12%	-10%	-9%	SD	-8%	-9%	-9%
KS	-6%	-8%	-9%	TN	-6%	-8%	-9%
KY	-9%	-9%	-9%	TX	-9%	-9%	-9%
LA	-8%	-8%	-9%	UT	-9%	-9%	-9%
ME	-11%	-10%	-9%	VT	-10%	-9%	-9%
MD	-12%	-10%	-9%	VA	-10%	-9%	-9%
MA	-10%	-9%	-9%	WA	-13%	-10%	-9%
MI	-12%	-11%	-10%	WV	-6%	-8%	-9%
MN	-12%	-10%	-9%	WI	-12%	-10%	-9%
MS	-5%	-8%	-9%	WY	-10%	-9%	-9%
MO	-9%	-9%	-9%				
Total	**-11%**	**-10%**	**-9%**				
Total $ (billions)	**-$49**	**-$45**	**-$46**				

Table 8
Effects of Pandemic on State and Local Fiscal Outlook, National Summary

	2020	2021	2022
Projected Declines in Revenues excluding Fees from Higher Ed and Hospitals	**$155**	**$167**	**$145**
Personal Income Tax Revenues	22	37	40
Corporate Income Tax Revenues	2	29	14
Sales Tax Revenues	49	45	46
Other Taxes and Fees	82	55	45
Projected Declines in Fees to Public Hospitals and Institutions of Higher Education	**$33**	**$22**	**$22**
Additional Demands on Spending	**?**	**?**	**?**
State Aid excluding Hospitals and Higher Ed	**$212**	**$19**	**$9**
Covid Relief	150		
K-12 Aid	13		
Transit	25		
Medicaid (Excess over additional Spending)	24	19	9
State Aid to Hospitals and Higher Ed	**$42**		
Health Provider Relief	35		
Higher Ed Relief	6.5		

Table 9
Projected Declines in Revenues as Share of Own Source Revenue, excluding Fees to Hospitals and Higher Ed

	2020	2021	2022		2020	2021	2022
AL	3.5%	4.7%	4.2%	MT	4.5%	4.6%	3.9%
AK	4.2%	2.9%	2.3%	NE	4.2%	4.9%	4.4%
AZ	5.7%	5.0%	4.4%	NV	9.6%	6.4%	5.4%
AR	4.0%	5.7%	5.4%	NH	3.3%	5.2%	3.3%
CA	6.8%	7.3%	6.1%	NJ	5.1%	5.1%	4.1%
CO	6.1%	5.1%	4.3%	NM	5.8%	4.9%	4.4%
CT	4.3%	5.7%	4.6%	NY	6.5%	7.9%	6.2%
DE	5.6%	6.0%	4.8%	NC	4.7%	4.6%	4.0%
FL	6.6%	5.5%	4.3%	OH	4.2%	4.1%	3.9%
GA	4.7%	5.0%	4.3%	OK	4.0%	4.6%	4.5%
HI	6.1%	7.2%	6.0%	OR	4.2%	5.6%	4.6%
ID	4.3%	5.8%	5.2%	PA	5.8%	5.6%	4.4%
IL	5.7%	5.3%	4.2%	RI	4.5%	4.5%	3.7%
IN	5.1%	5.4%	4.4%	SC	3.7%	3.8%	3.2%
IA	3.9%	4.3%	3.7%	SD	5.1%	4.9%	4.5%
KS	3.1%	4.2%	3.7%	TN	4.5%	7.4%	5.6%
KY	4.0%	4.9%	4.2%	TX	5.0%	4.0%	3.6%
LA	5.5%	5.1%	4.6%	UT	4.5%	4.8%	4.3%
ME	5.2%	5.5%	4.7%	VT	3.9%	5.3%	4.3%
MD	5.4%	5.8%	4.8%	VA	5.3%	4.9%	4.2%
MA	4.5%	5.9%	4.6%	WA	7.5%	5.2%	4.5%
MI	4.5%	5.3%	4.5%	WV	4.2%	4.7%	4.3%
MN	5.5%	6.5%	5.6%	WI	4.6%	5.2%	4.4%
MS	3.3%	4.4%	3.9%	WY	3.4%	2.9%	2.7%
MO	4.5%	4.5%	4.1%				
Total	**5.5%**	**5.7%**	**4.7%**				

Table 10
Distribution of Aid as a Share of Own Source General Revenues, 2020

	Aid Excluding Hospitals and Higher Ed	Aid to Hospitals and Higher Ed		Aid Excluding Hospitals and Higher Ed	Aid to Hospitals and Higher Ed
AL	7.5%	1.9%	MT	20.1%	3.6%
AK	15.9%	0.9%	NE	8.8%	2.0%
AZ	9.0%	1.6%	NV	7.8%	1.2%
AR	8.4%	2.4%	NH	13.0%	1.7%
CA	5.8%	0.9%	NJ	6.3%	1.9%
CO	6.1%	1.0%	NM	10.6%	1.6%
CT	5.8%	1.1%	NY	5.9%	1.8%
DE	16.0%	1.8%	NC	7.2%	1.5%
DC	11.4%	1.0%	ND	16.3%	1.8%
FL	7.5%	1.4%	OH	6.8%	1.3%
GA	8.5%	2.0%	OK	7.8%	2.3%
HI	8.9%	0.8%	OR	6.2%	1.2%
ID	13.3%	1.6%	PA	7.1%	1.2%
IL	7.0%	1.5%	RI	15.3%	1.1%
IN	7.5%	1.8%	SC	6.9%	1.5%
IA	4.9%	1.4%	SD	22.0%	3.1%
KS	6.1%	1.9%	TN	9.0%	2.1%
KY	8.3%	2.1%	TX	7.5%	1.2%
LA	7.9%	2.5%	UT	6.7%	0.9%
ME	14.1%	1.9%	VT	22.9%	1.5%
MD	6.3%	1.2%	VA	6.0%	1.1%
MA	6.5%	1.4%	WA	5.9%	1.1%
MI	6.8%	2.0%	WV	11.9%	3.0%
MS	5.7%	1.1%	WI	6.7%	1.3%
MN	13.9%	3.3%	WY	19.5%	1.6%
MO	5.4%	1.7%			
Total	**7.5%**	**1.5%**			

Figure 1. Real GDP, 2020 - 2050

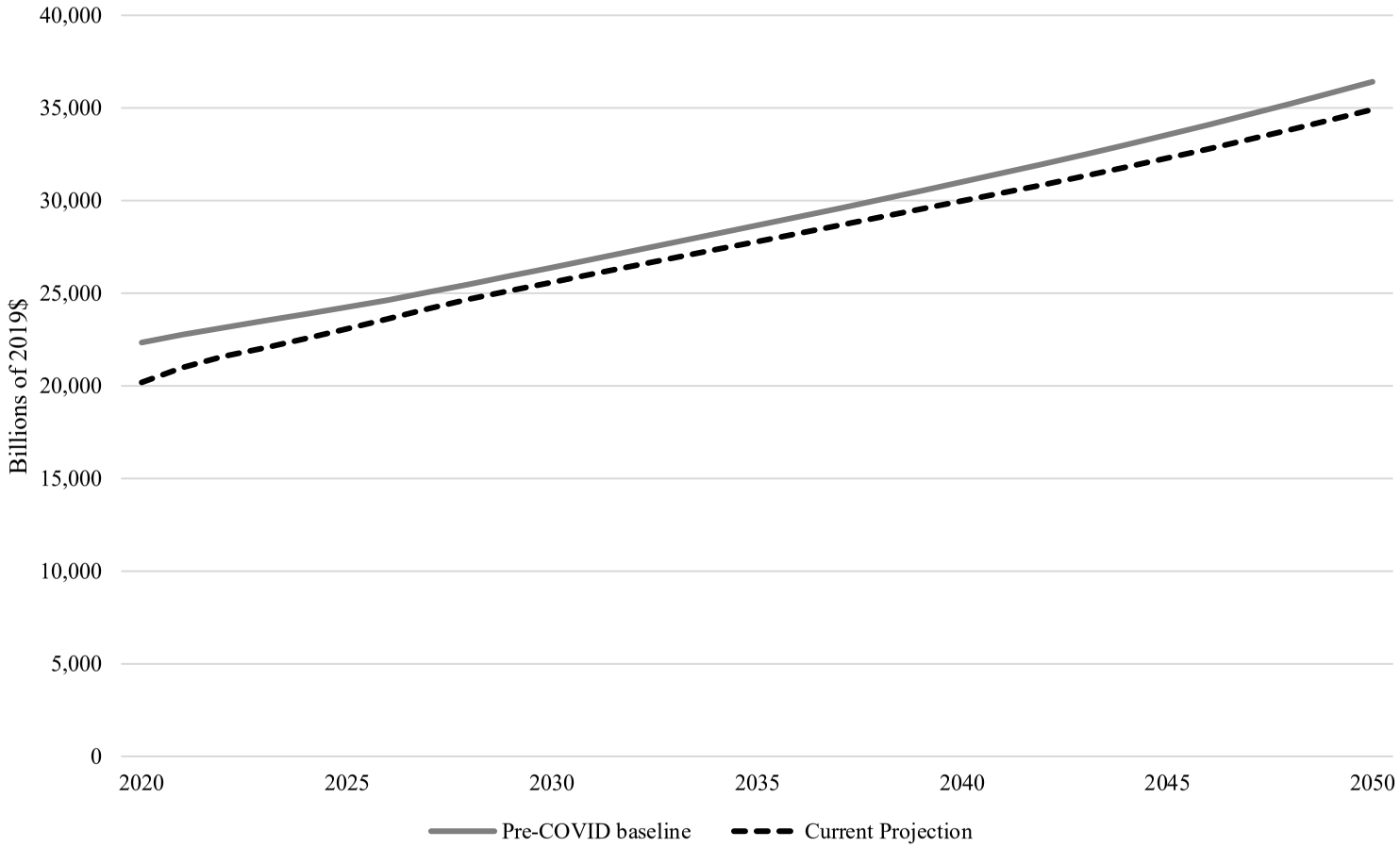


Figure 2. Effective Interest Rate, 2000 - 2050

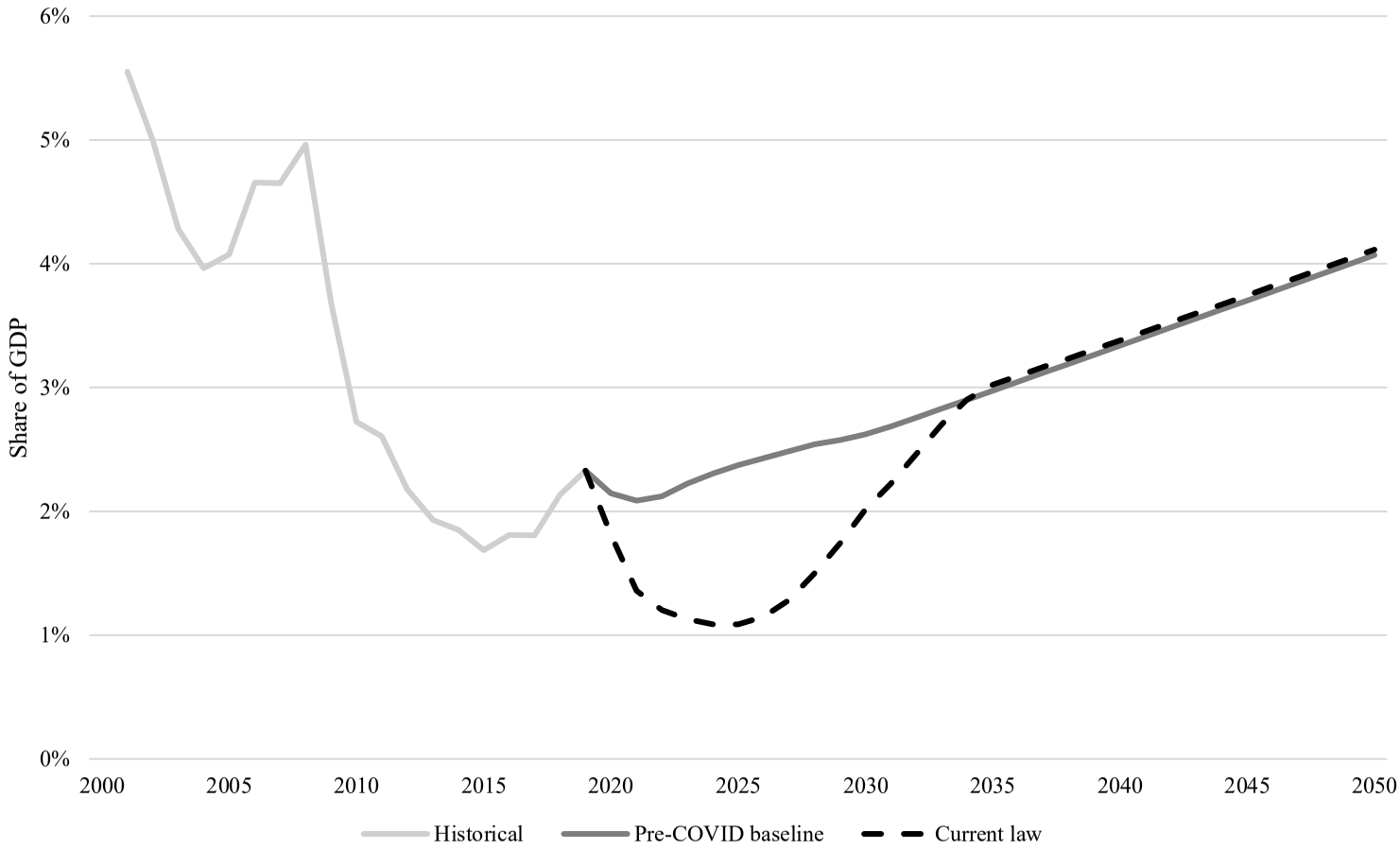


Figure 3. Non-Interest Spending, 2000 - 2050

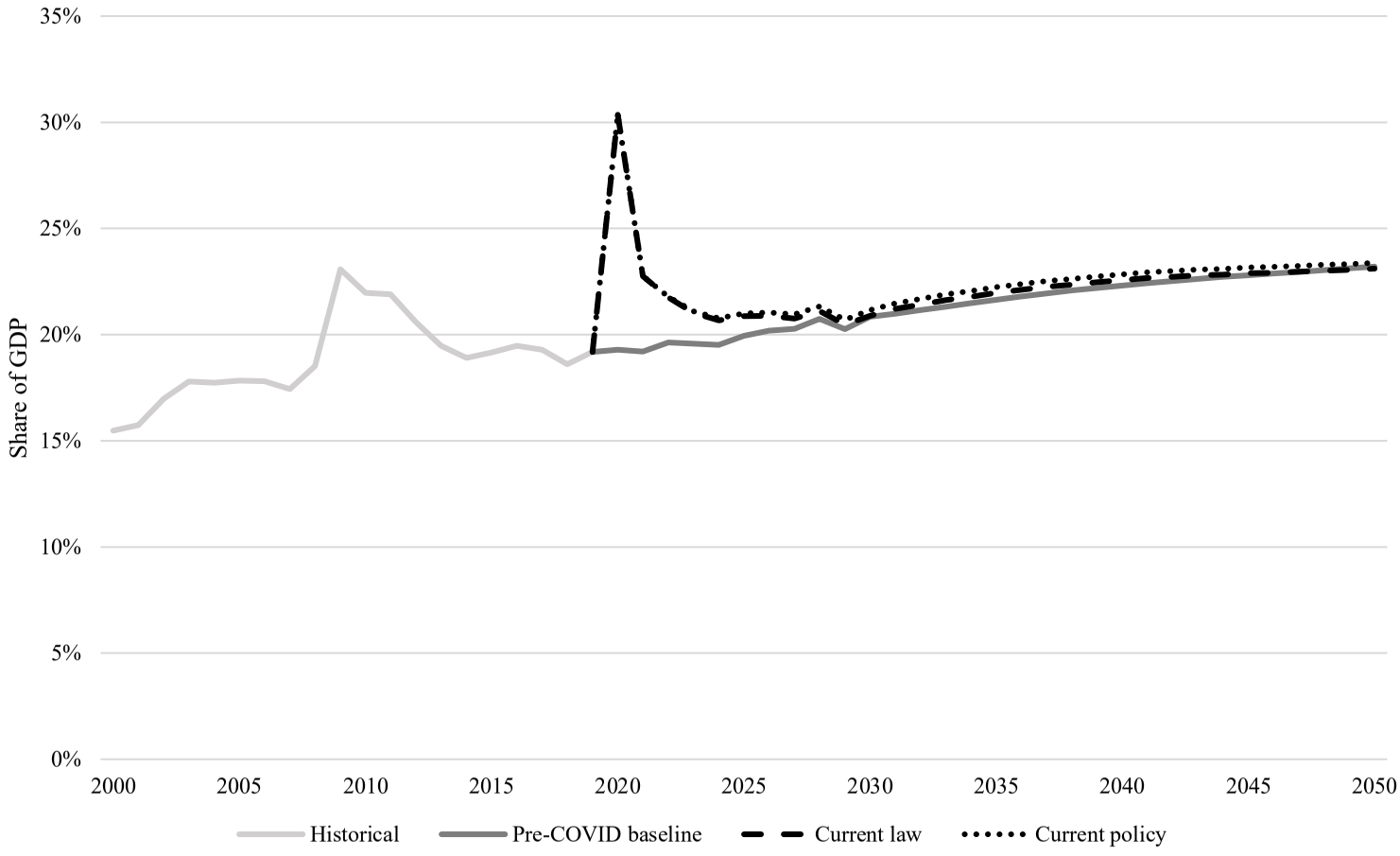


Figure 4. Revenue, 2000 - 2050

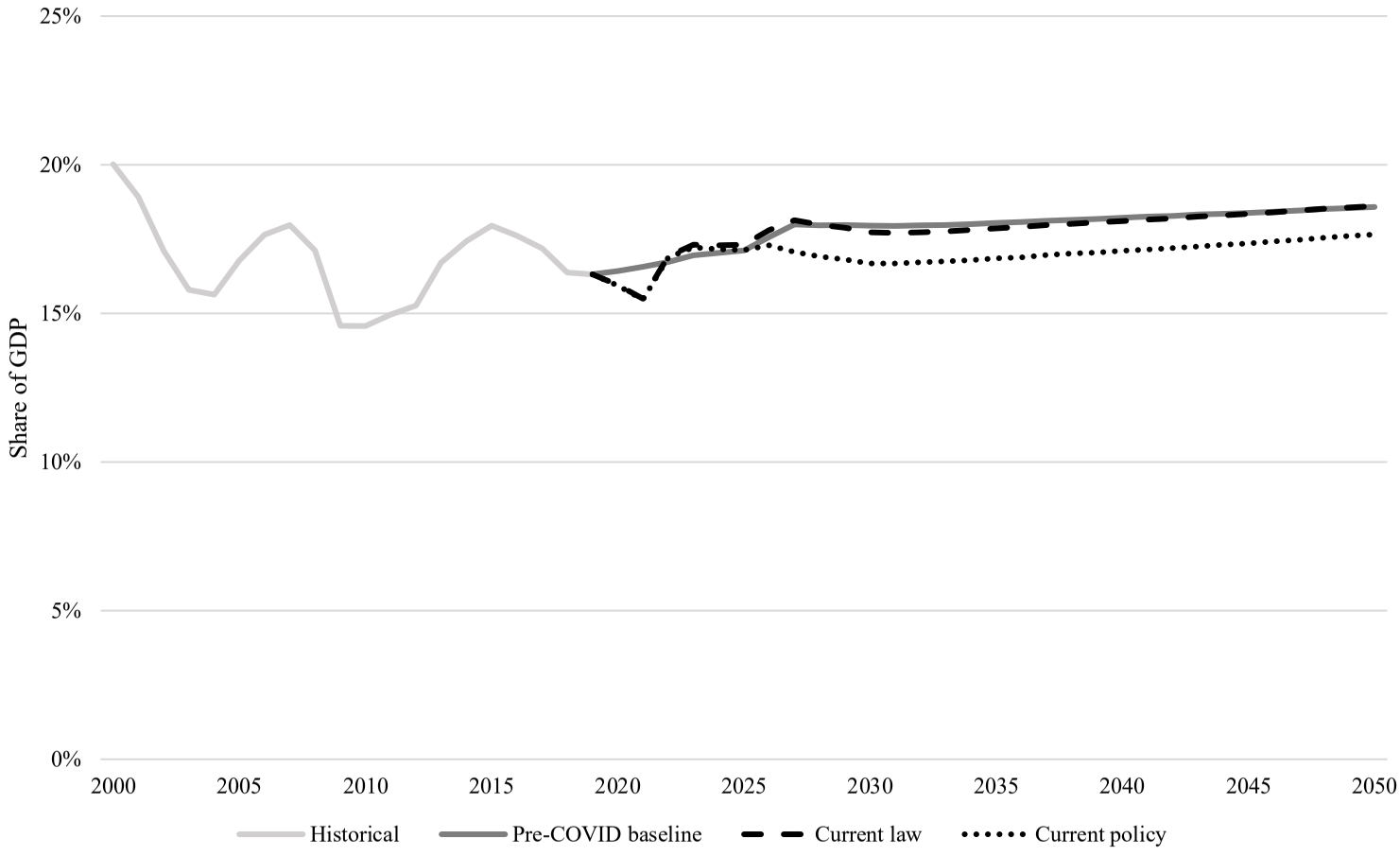
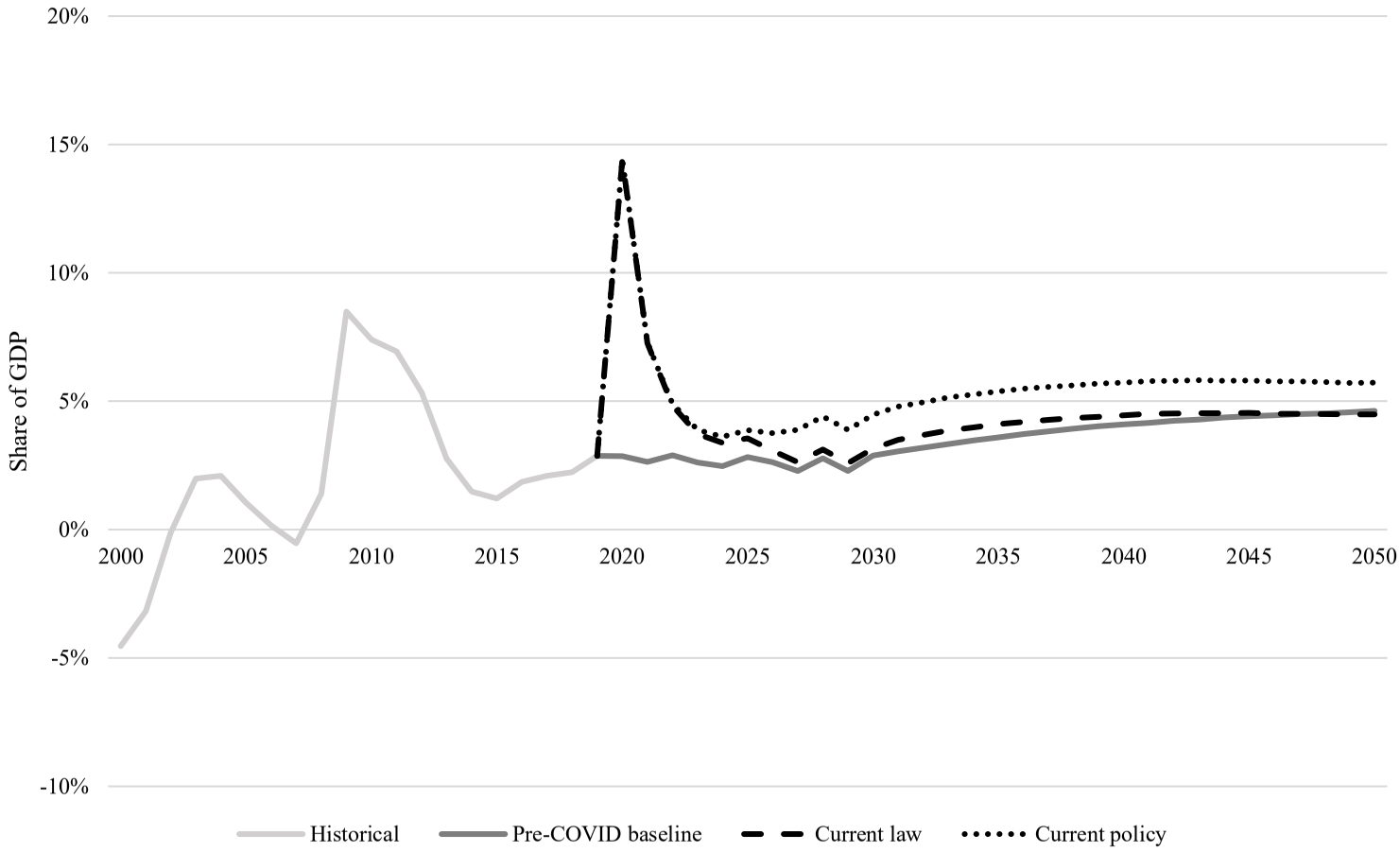


Figure 5. Primary Deficit, 2000 - 2050



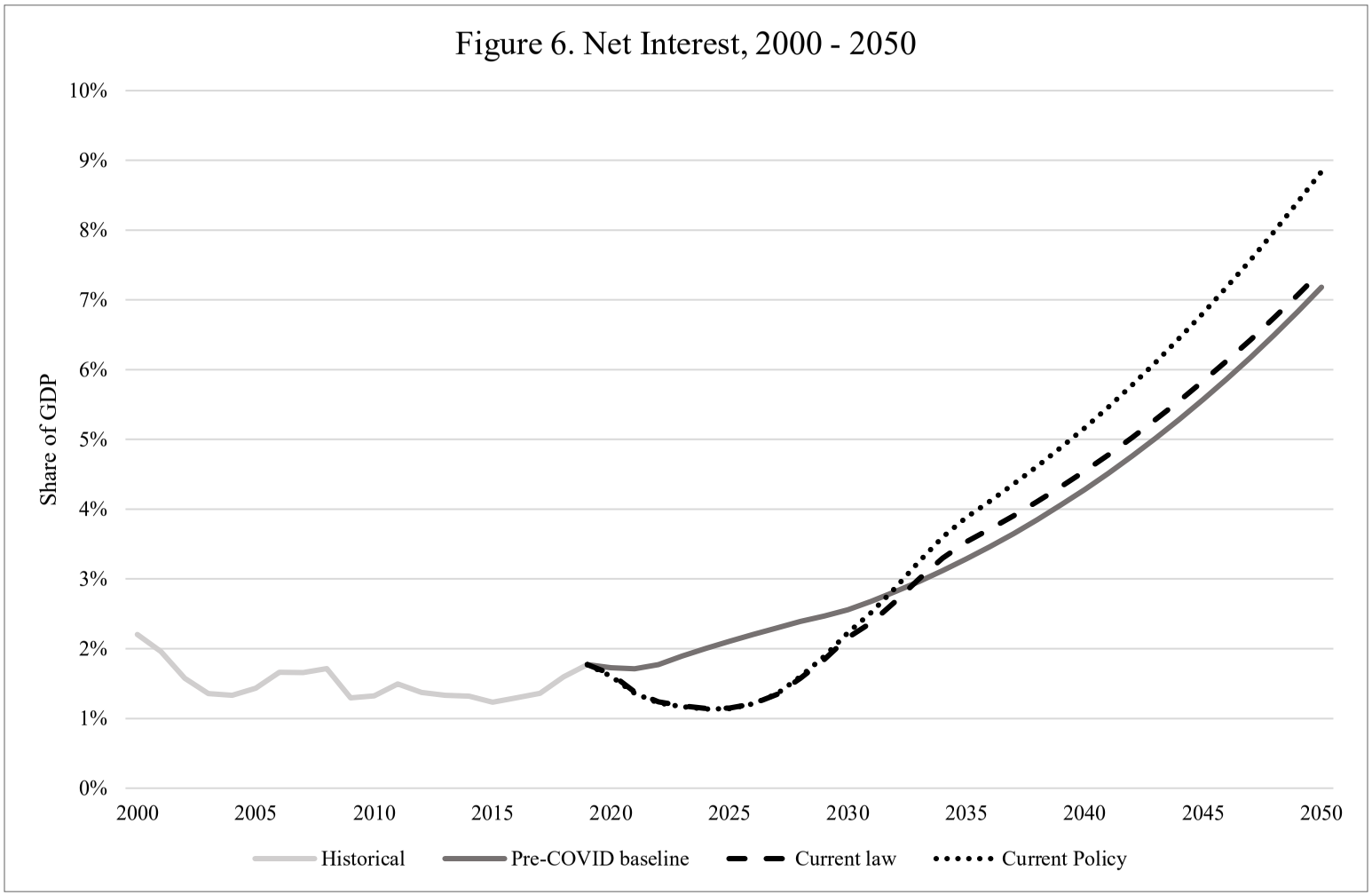


Figure 6. Net Interest, 2000 - 2050
10%
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
Share of GDP
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Historical
Pre-COVID baseline
Current law
Current Policy

Figure 7. Unified Deficit, 2000 - 2050

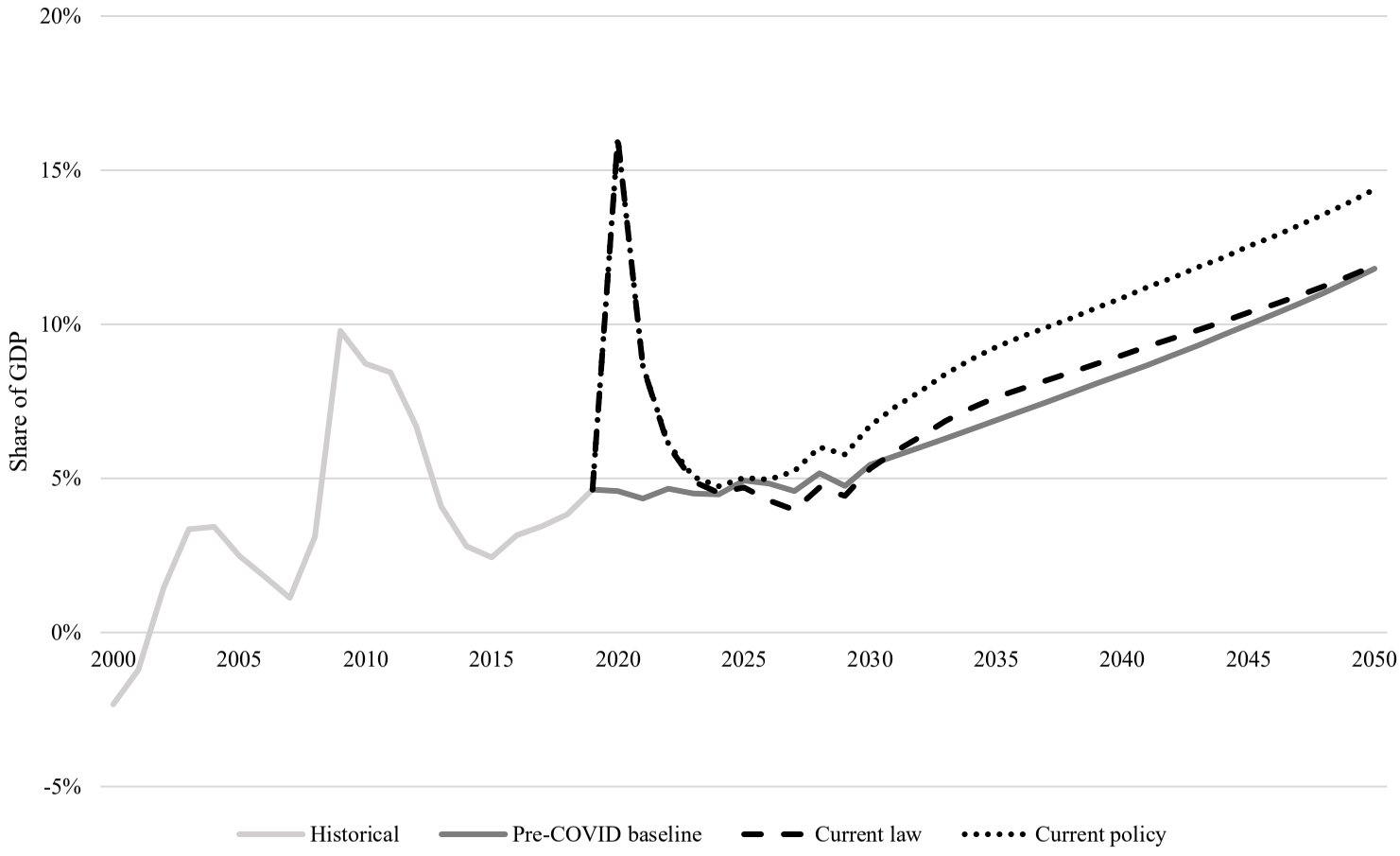


Figure 8. Public Debt, 2000- 2050

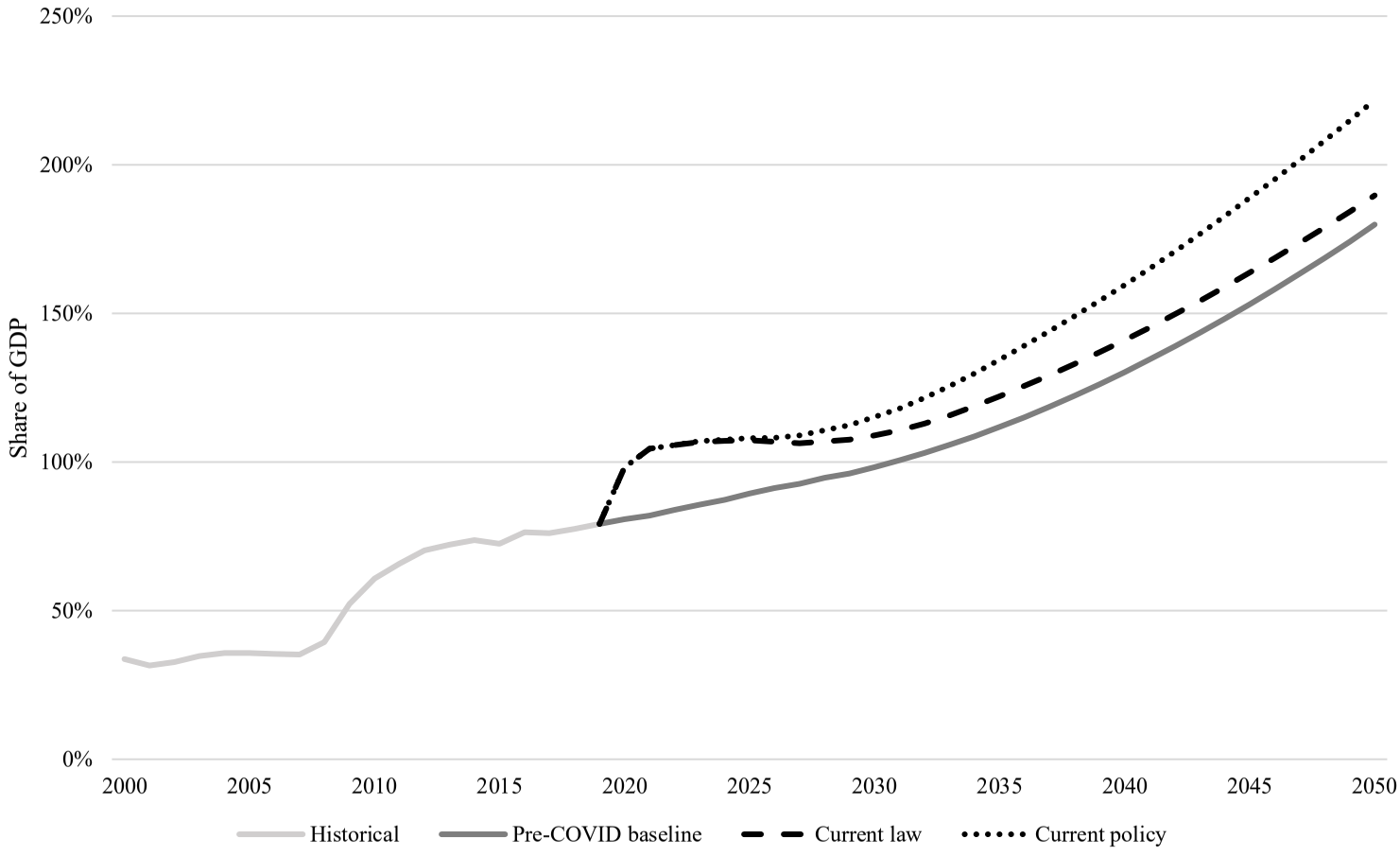
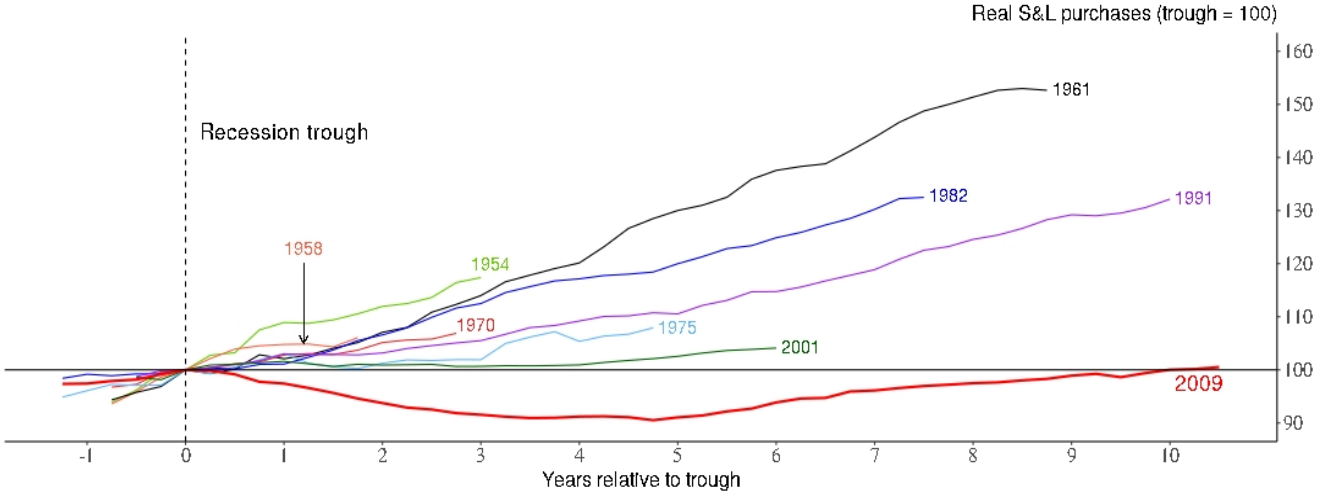


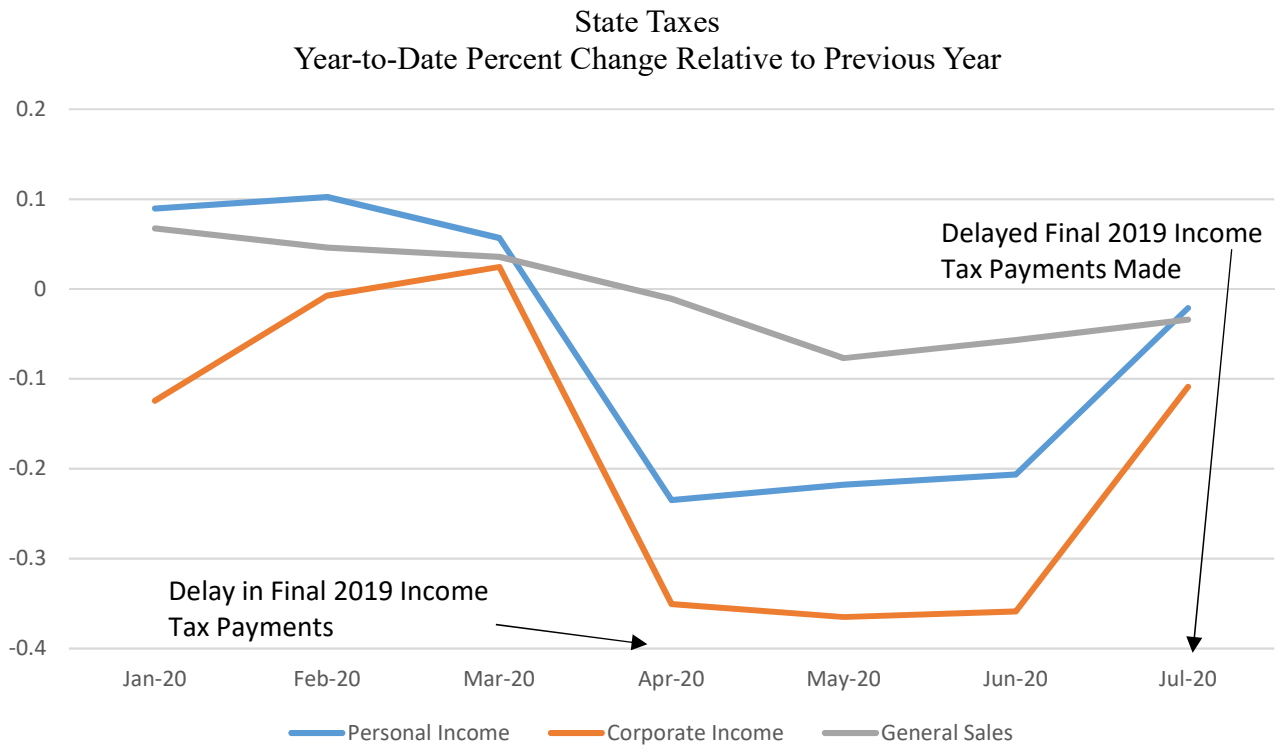
Figure 9.

State and Local Government Purchases by Expansion



Note: The year labels attached to each line refer to the starting year of the expansion as defined by the National Bureau of Economic Research.
Source: Bureau of Economic Analysis.

Figure 10



Note. Figure displays percent changes for 2020 relative to 2019 for year-to-date state government tax collections. Tax collections reflect data for 41 states accounting for 87 percent of national personal income tax and national sales tax collections and 83 percent of national corporate income tax collections. Source: Analysis is based on data provided by the Urban Institute available at: https://www.urban.org/policy-centers/cross-center-initiatives/state-and-local-finance-initiative/projects/state-tax-and-economic-review/data-subscriptions

Figure 11. Employment Rates for United States Workers Compared to January 2020, as of July 2020

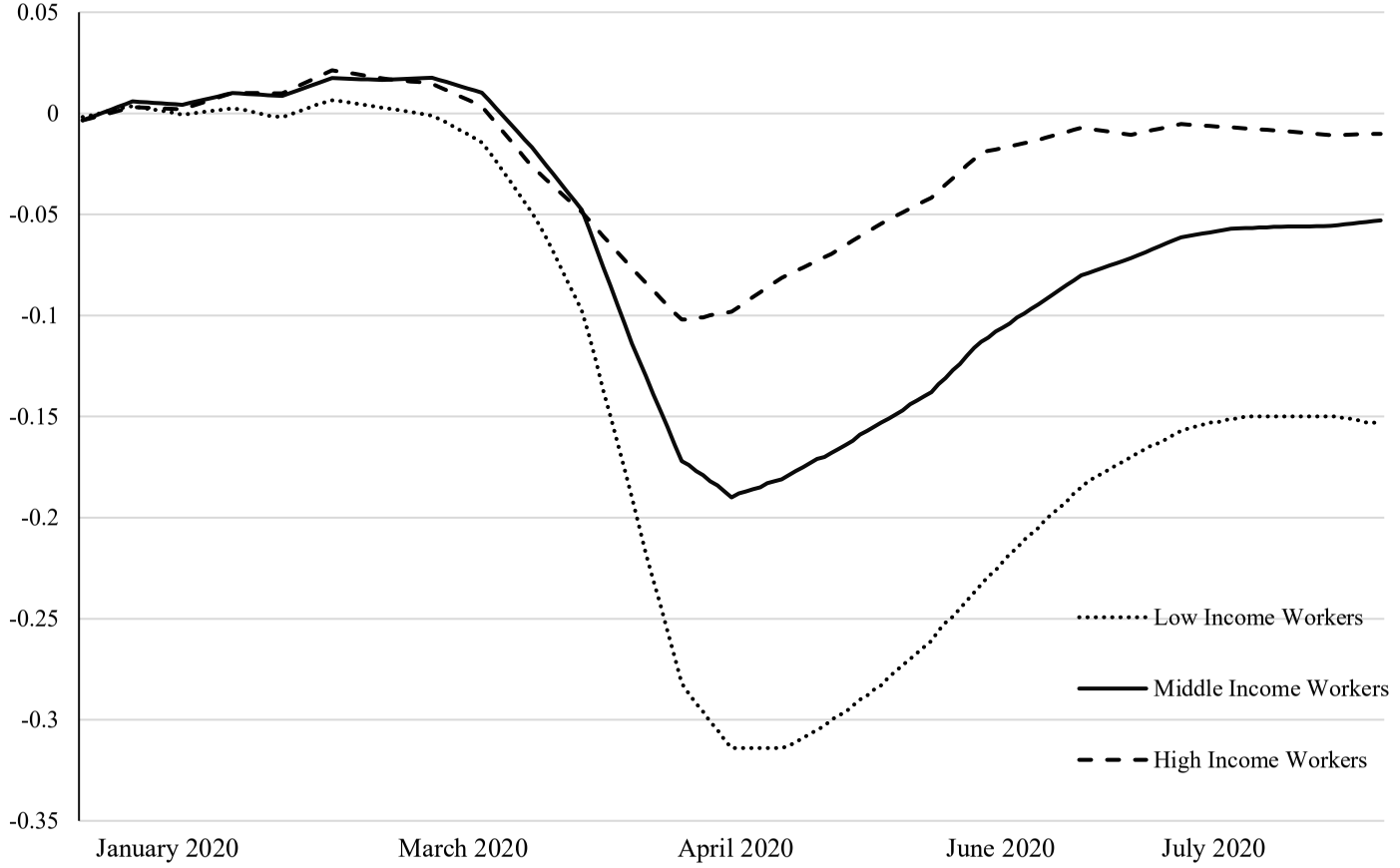
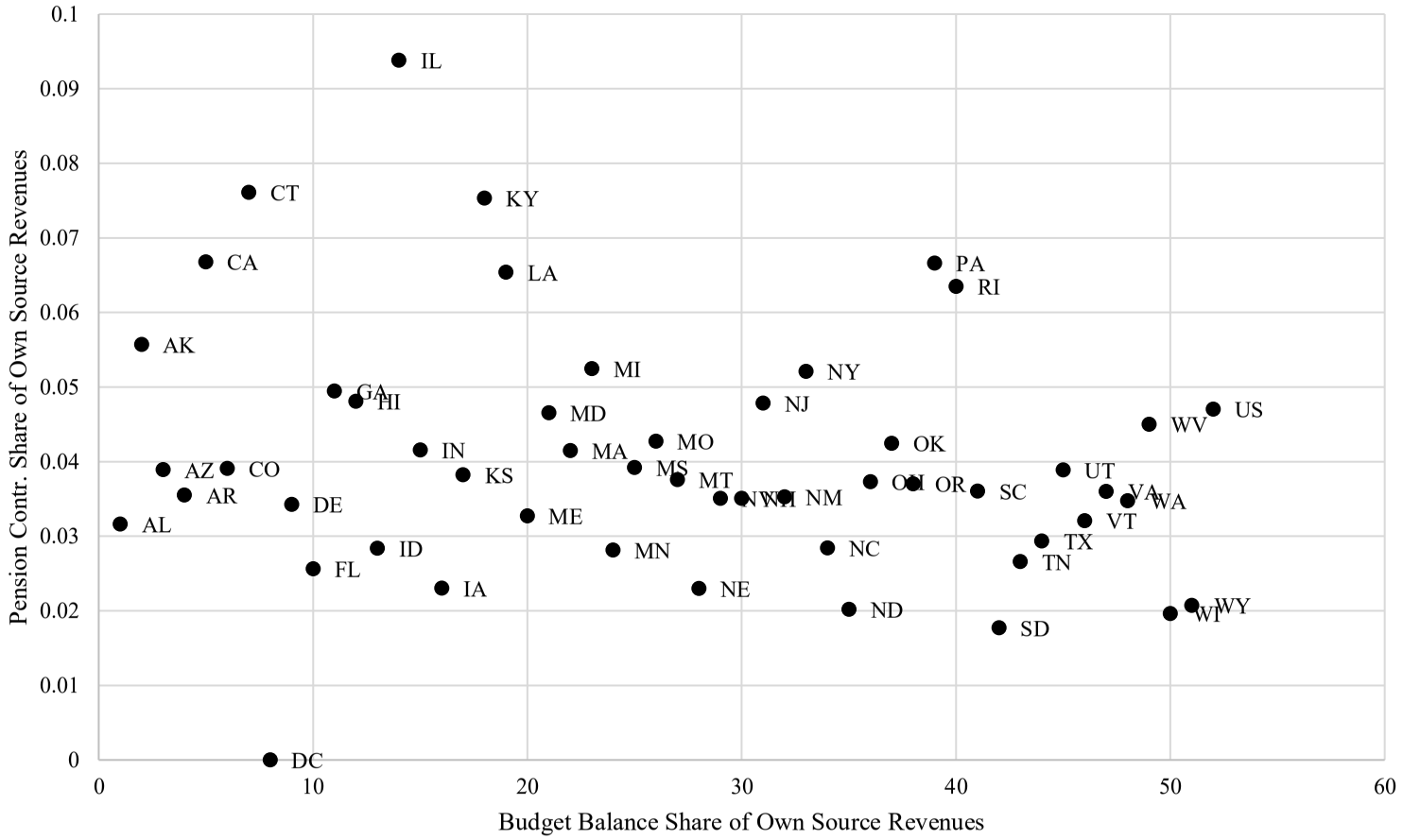


Figure 12. State Pension Contribution Shares and Budget Balances



Appendix Table 1
Projected Declines in State and Local Corporate Income Tax Revenues (Billions of $)

	2020	2021	2022		2020	2021	2022
AL	0.02	0.34	0.16	MT	0.00	0.06	0.03
AK	0.00	0.02	0.01	MT	0.01	0.13	0.06
AZ	0.01	0.15	0.07	NE	0.00	0.00	0.00
AR	0.01	0.22	0.10	NV	0.02	0.33	0.15
CA	0.36	6.12	2.86	NH	0.06	1.08	0.51
CO	0.01	0.24	0.11	NJ	0.00	0.03	0.01
CT	0.04	0.63	0.30	NM	0.33	5.54	2.59
DE	0.01	0.12	0.06	NY	0.02	0.28	0.13
DC	0.02	0.37	0.17	NC	0.00	0.01	0.01
FL	0.09	1.46	0.68	ND	0.01	0.12	0.05
GA	0.03	0.55	0.26	OH	0.00	0.05	0.02
HI	0.01	0.13	0.06	OK	0.03	0.47	0.22
ID	0.01	0.13	0.06	OR	0.09	1.53	0.72
IL	0.07	1.19	0.56	PA	0.00	0.07	0.03
IN	0.04	0.64	0.30	RI	0.01	0.21	0.10
IA	0.02	0.26	0.12	SC	0.00	0.02	0.01
KS	0.01	0.24	0.11	SD	0.07	1.23	0.58
KY	0.02	0.30	0.14	TN	0.00	0.00	0.00
LA	0.01	0.12	0.05	T	0.01	0.19	0.09
ME	0.01	0.09	0.04	UT	0.00	0.06	0.03
MD	0.03	0.56	0.26	VT	0.03	0.49	0.23
MA	0.07	1.22	0.57	VA	0.00	0.00	0.00
MI	0.05	0.81	0.38	WA	0.00	0.04	0.02
MN	0.04	0.65	0.30	WV	0.03	0.52	0.25
MS	0.01	0.19	0.09	WI	0.00	0.00	0.00
MO	0.01	0.20	0.09	WY	0.00	0.03	0.01
Total	2	29	14				

Note. The table displays projected declines in state and local government corporate income taxes.

Appendix Table 2
Tax Base Assumptions for Other Taxes, Fees, and Miscellaneous General Revenues

Revenue Source	Assumed Tax Base	Social Distancing
	A. Other Taxes	
Other Select Sales Tax	NIPA Table 2.4.5U: personal consumption expenditures	
Motor Fuels Tax	NIPA Table 2.4.5U: gasoline and other motor fuel; state-level miles driven*	X
Other License Taxes	NIPA Table 2.4.5U: personal consumption expenditures	
Taxes NEC	NIPA Table 2.4.5U: personal consumption expenditures	
Motor Veh & Oper Lic	NIPA Table 2.4.5U: motor vehicle transportation services	
Public Utility Tax	NIPA Table 2.4.5U: household utilities	
Insurance Premium Tax	NIPA Table 2.4.5U: life insurance	
Tobacco Tax	NIPA Table 2.4.5U: tobacco	
Amusement Tax	NIPA Table 2.4.5U: membership clubs & participant sports centers	X
Alcoholic Beverage Tax	NIPA Table 2.4.5U: alcohol (in purchased meals and for off-premises consumption)	
Corporation License	NIPA Table 2.4.5U: personal consumption expenditures	
Alcoholic Beverage Lic	NIPA Table 2.4.5U: alcohol (in purchased meals and for off-premises consumption)	
Parimutuels Tax	NIPA Table 2.4.5U: pari-mutuel net receipts	X
	B. Fees	
Hospitals	NIPA Table 2.4.5U: government hospitals; state-level health care spending**	X
High Ed-Other	NIPA Table 2.4.5U: proprietary & public higher education	
All Other NEC	NIPA Table 2.4.5U: personal consumption expenditures	
Sewerage	NIPA Table 2.4.5U: water supply & sewage maintenance	
High Ed-Aux Enterp	NIPA Table 2.4.5U: proprietary & public higher education	
Air Transportation	NIPA Table 2.4.5U: air transportation	X
Solid Waste Mgmt	NIPA Table 2.4.5U: garbage and trash collection	
Toll Highways	NIPA Table 2.4.5U: parking fees and tolls	X

Parks & Recreation	NIPA Table 2.4.5U: amusement parks, campgrounds & related	X
Education NEC	NIPA Table 2.4.5U: education services	
Housing & Comm Dev	NIPA Table 2.4.5U: rental of tenant-occupied nonfarm housing	
Water Transport	NIPA Table 2.4.5U: water transportation	X
Elem Ed-Sch Lunch	NIPA Table 2.4.5U: elementary & secondary school lunches	
Total Nat Res	WTI oil, price per barrel	
Parking	NIPA Table 2.4.5U: parking fees and tolls	X
Regular Highways	NIPA Table 2.4.5U: parking fees and tolls	X
	C. Non-interest Miscellaneous General Revenue	
Total	NIPA Table 2.4.5U: personal consumption expenditures	

Note. Social distancing denotes a tax or fee assumed to be directly influenced by social distancing.
* FHWA Traffic Volume Trends, all roads; projected for unavaliable months using Opportunity Insights state-level data on time away from home. ** Opportunity Insights, state-level consumption of health services.

Appendix Table 3
Projected Declines in Other Taxes and Fees Other than Fees for Higher Education and Hospitals (billions of $)

	2020	2021	2022		2020	2021	2022
AL	0.7	0.5	0.5	MT	0.2	0.2	0.2
AK	0.4	0.2	0.2	NE	0.4	0.3	0.3
AZ	1.0	0.6	0.5	NV	1.3	0.8	0.6
AR	0.4	0.3	0.3	NH	0.3	0.2	0.2
CA	11.9	8.7	7.4	NJ	2.2	1.4	1.1
CO	1.7	1.1	0.8	NM	0.4	0.3	0.3
CT	0.7	0.5	0.4	NY	7.3	4.5	3.5
DE	0.4	0.3	0.3	NC	1.8	1.3	1.1
DC	0.1	0.1	0.1	ND	0.4	0.3	0.3
FL	6.2	3.9	3.1	OH	2.1	1.4	1.2
GA	1.8	1.1	0.9	OK	0.7	0.5	0.4
HI	0.6	0.4	0.3	OR	1.3	1.0	0.8
ID	0.3	0.3	0.2	PA	3.9	2.4	1.9
IL	4.1	2.4	1.9	RI	0.2	0.2	0.1
IN	1.1	0.7	0.6	SC	0.9	0.7	0.6
IA	0.7	0.5	0.4	SD	0.2	0.1	0.1
KS	0.5	0.3	0.3	TN	1.1	0.8	0.7
KY	0.7	0.5	0.4	TX	6.3	4.2	3.5
LA	1.0	0.6	0.4	UT	0.6	0.4	0.4
ME	0.3	0.2	0.2	VT	0.1	0.1	0.1
MD	2.0	1.3	1.0	VA	2.3	1.4	1.1
MA	1.9	1.2	0.9	WA	2.6	1.8	1.4
MI	1.9	1.4	1.2	WV	0.4	0.3	0.3
MN	1.6	1.2	1.0	WI	1.1	0.8	0.7
MS	0.4	0.3	0.3	WY	0.2	0.1	0.1
MO	1.0	0.7	0.5				
TOTAL	**81.6**	**55.1**	**45.3**				

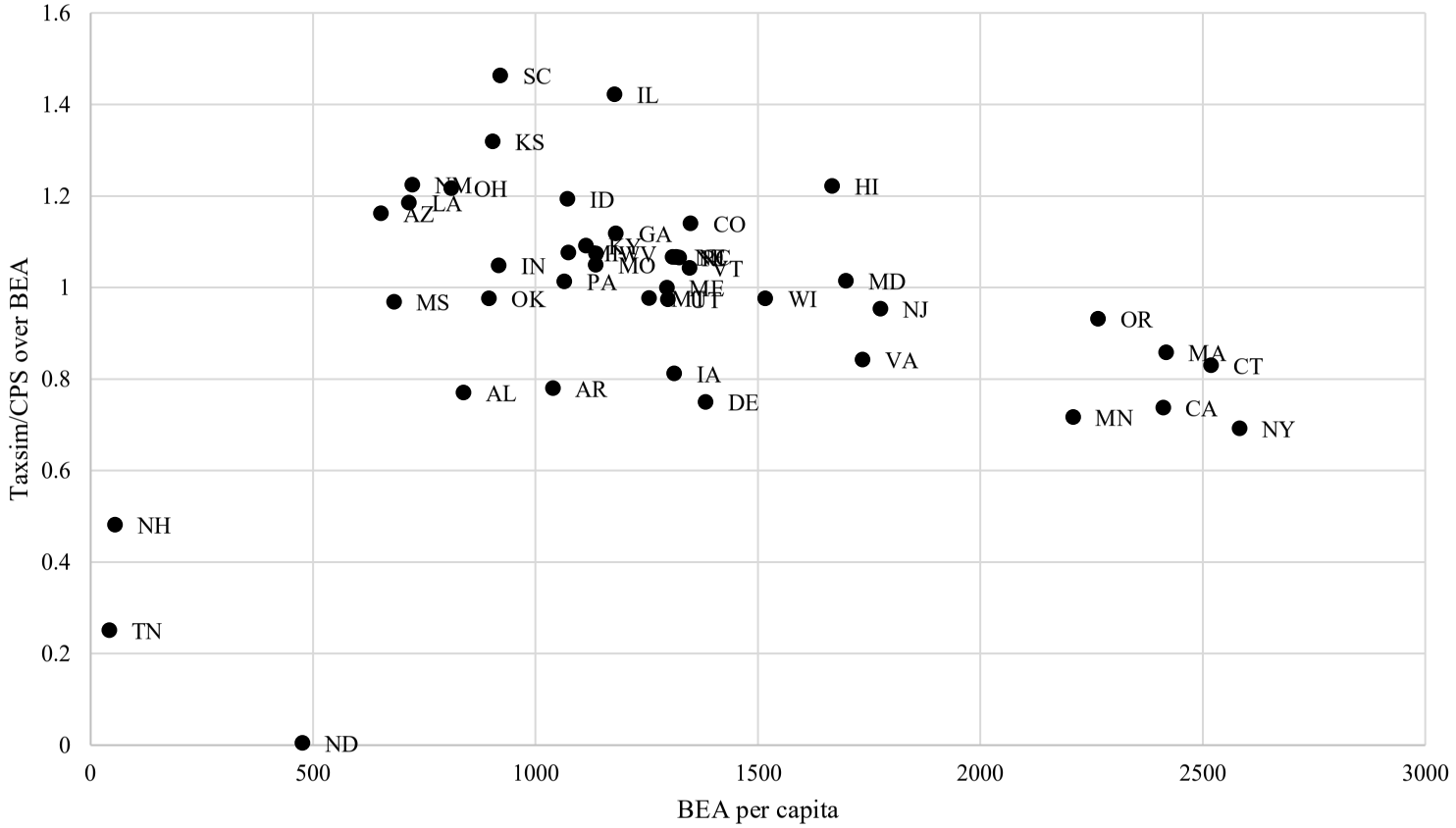
Note. The table displays projected declines in state and local government taxes other than the property tax, individual income tax, corporate income tax, and sales tax plus projected declines in fees other than fees for higher education and hospitals.

Appendix Table 4
Projected Declines in Fees for Higher Education and Hospitals (billions of $)

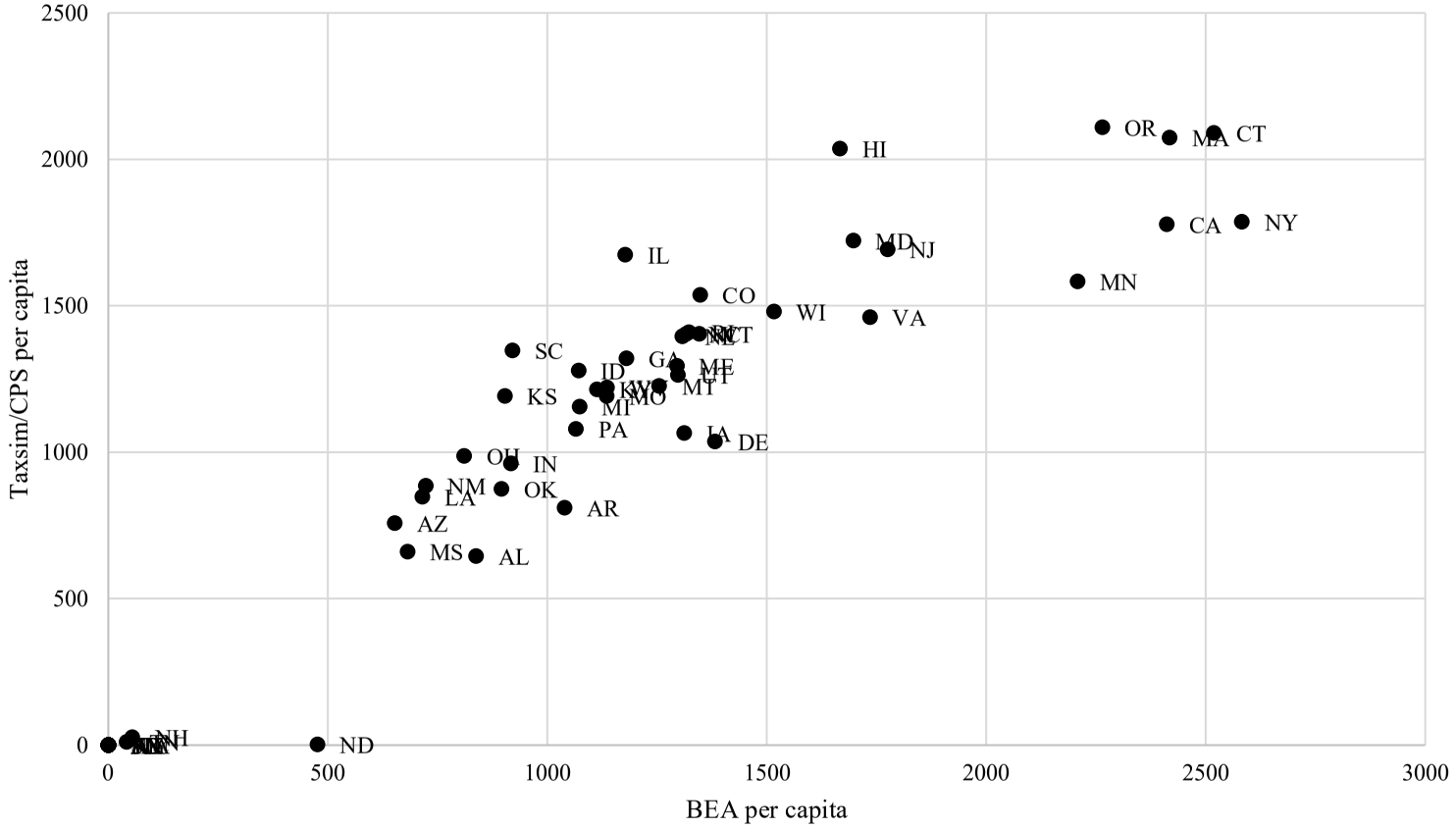
	2020	2021	2022		2020	2021	2022
AL	1.1	0.7	0.7	MT	0.0	0.0	0.0
AK	0.2	0.1	0.1	NE	0.1	0.1	0.1
AZ	0.2	0.2	0.2	NV	0.1	0.1	0.1
AR	0.0	0.1	0.2	NH	0.0	0.0	0.0
CA	5.3	3.3	3.5	NJ	0.3	0.3	0.2
CO	0.6	0.4	0.4	NM	0.2	0.2	0.2
CT	0.2	0.1	0.1	NY	2.4	1.3	1.3
DE	0.0	0.0	0.0	NC	2.2	1.4	1.3
DC	0.0	0.0	0.0	ND	0.0	0.0	0.0
FL	1.4	1.0	1.1	OH	1.3	0.9	0.8
GA	0.7	0.5	0.6	OK	0.1	0.2	0.2
HI	0.0	0.0	0.1	OR	0.5	0.3	0.3
ID	0.1	0.1	0.1	PA	0.8	0.5	0.6
IL	0.5	0.4	0.3	RI	0.0	0.0	0.0
IN	1.7	0.9	0.6	SC	0.7	0.6	0.8
IA	1.3	0.7	0.5	SD	0.0	0.0	0.0
KS	0.6	0.4	0.4	TN	0.5	0.4	0.4
KY	0.4	0.4	0.3	TX	1.8	1.5	1.8
LA	0.2	0.2	0.3	UT	0.9	0.5	0.3
ME	0.0	0.0	0.0	VT	0.0	0.0	0.0
MD	0.1	0.1	0.1	VA	1.1	0.7	0.7
MA	0.2	0.1	0.1	WA	0.6	0.5	0.6
MI	1.7	1.0	0.8	WV	0.1	0.1	0.1
MN	0.5	0.3	0.3	WI	0.5	0.3	0.3
MS	0.6	0.4	0.4	WY	0.2	0.2	0.1
MO	0.6	0.4	0.4				
TOTAL	32.8	22.2	22.1				

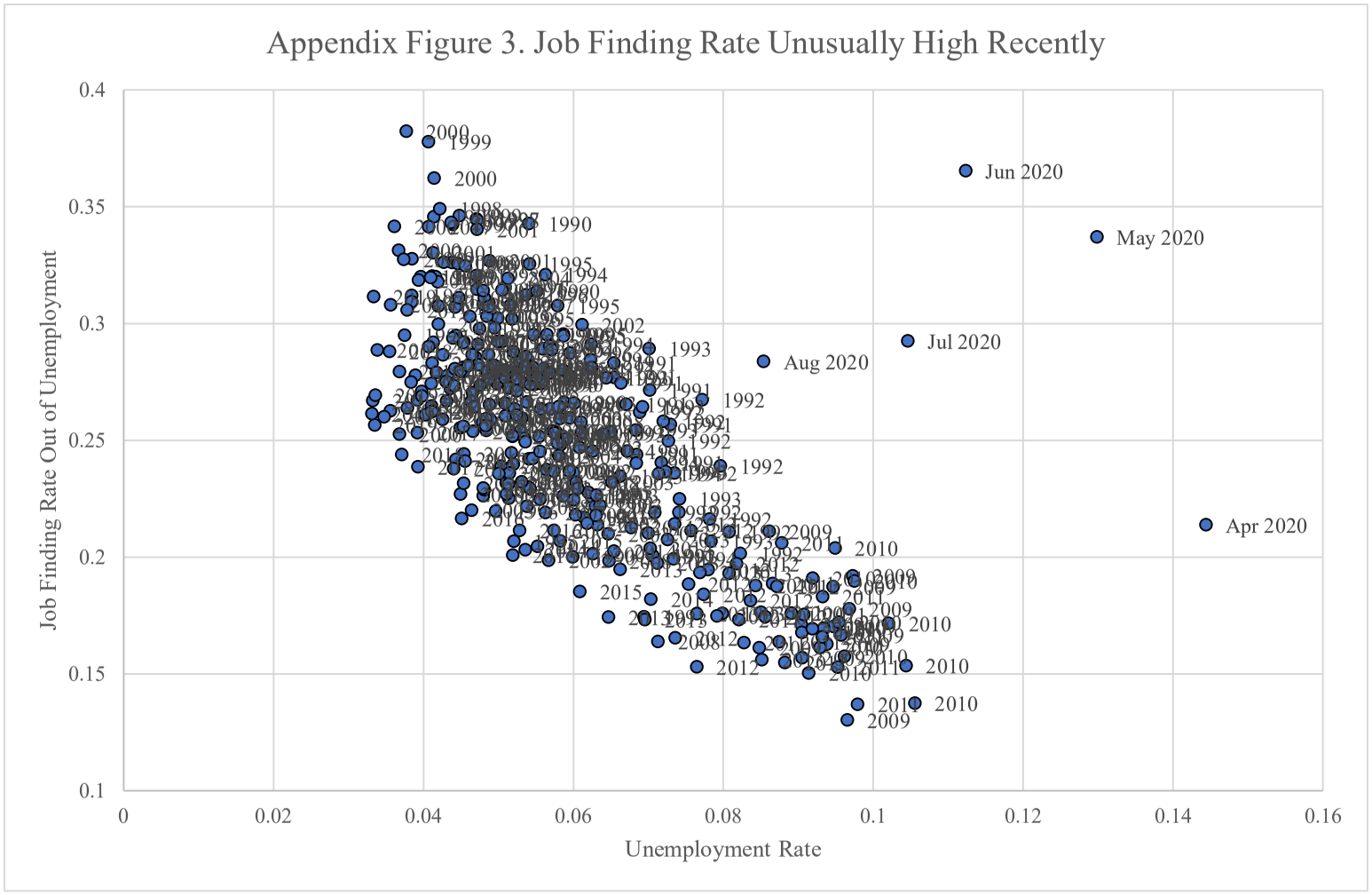
Note. The table displays projected declines in state and local government fees for higher education and hospitals.

Appendix Figure 1. Ratio of Taxsim/CPS per Capita to Actual Tax Revenues (Dollars)



Appendix Figure 2. Per Capita State Tax Revenue: Taxsim/CPS versus Actual (Dollars)




Appendix Figure 3. Job Finding Rate Unusually High Recently
Job Finding Rate Out of Unemployment
Unemployment Rate
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
Jun 2020
May 2020
Jul 2020
Aug 2020
Apr 2020