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Budget Model

Decomposing the Decline in Estate Tax Liability Since 2000

Summary: We estimate that the federal estate tax would have generated 9 times more revenue in 2019 without the tax changes in 2001 and 2017.

Key Points

- Tax cuts and higher life expectancy have reduced estate tax revenues over the last two decades, outweighing revenue gains from an older population and strong asset price gains.

- Growing levels of tax avoidance and/or evasion likely contributed to falling estate tax revenues over this period.

- Under a counterfactual scenario where the 2000 tax code was in effect for tax year 2019, the estate tax would have generated 9 times as much tax liability ($85B counterfactual vs $9B actual) and 100 times as many taxable estates (127,000 counterfactual vs 1,275 actual).

Introduction

The federal estate tax, which assesses a tax on the value of assets transferred at death, has diminished in scope over the last two decades. Major tax legislation enacted in 2001 and in 2017 cut estate tax revenue, primarily by limiting the number of estates subject to the tax. Other changes in the US economy during this period should have *increased* estate tax liability. These factors include population aging, more household saving driven by income growth, and rising asset prices.

Still, as shown in Figure 1, the estate tax liability as a share of GDP fell to less than one quarter of its 2001 level following the 2017 tax act. Taxable estates at death (as a share of total deaths) fell almost 98 percent from the 2001 level. In filing year 2001, nearly 52,000 estates owed a total of $23.5 billion in taxes. Twenty years later, just under 1,300 taxable estates were taxable, owing a collective $9.3 billion.

Figure 1. Estate Tax Liability (Share of GDP) and Taxable Estates (Share of Total Deaths), Filing Years 2001-2020

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Liability

Taxable estates
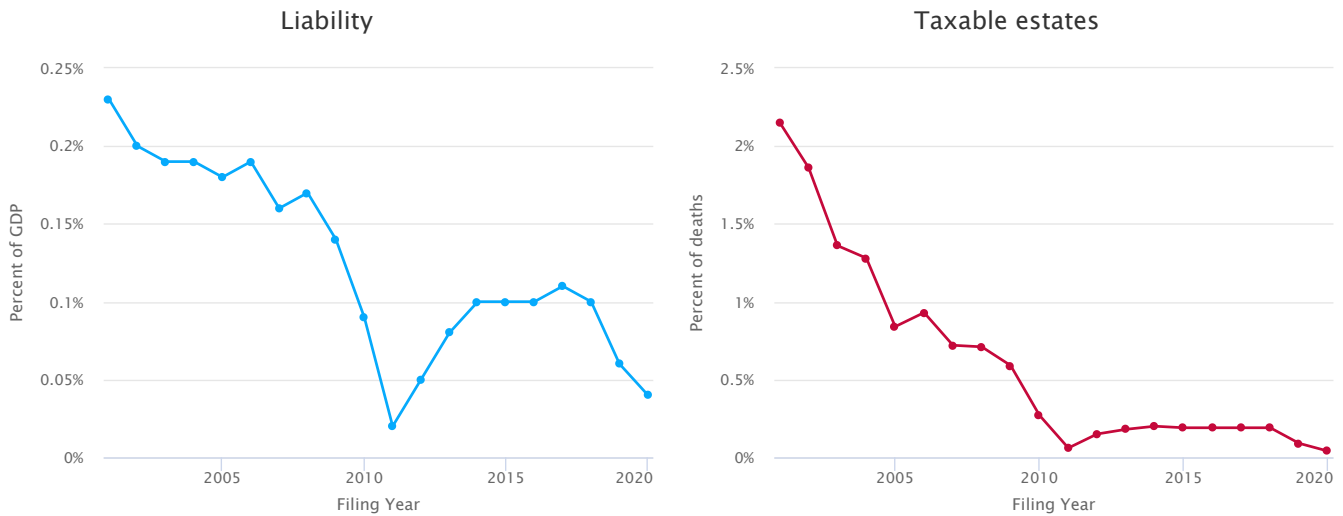
What key factors explain the decline in estate tax revenue? How much additional revenue would the estate tax raise if the estate tax cuts from the last twenty years were never enacted? How many more estates would be taxed? We answer these questions by decomposing the observed change in estate taxes into demographic, economic, and tax-related factors.

Background: Estate Tax Legislation

Estate tax law has undergone several significant changes since 2000. The exemption (the amount of wealth transfers above which tax applies) was raised by gradual increments throughout the 2000s and then by larger steps in 2012 and in 2017. This growth limited the number of estates subject to tax. The top estate tax rate was also lowered during this time period.

Figure 2. Estate Tax Exemption and Top Rate, Tax Years 2000-2019

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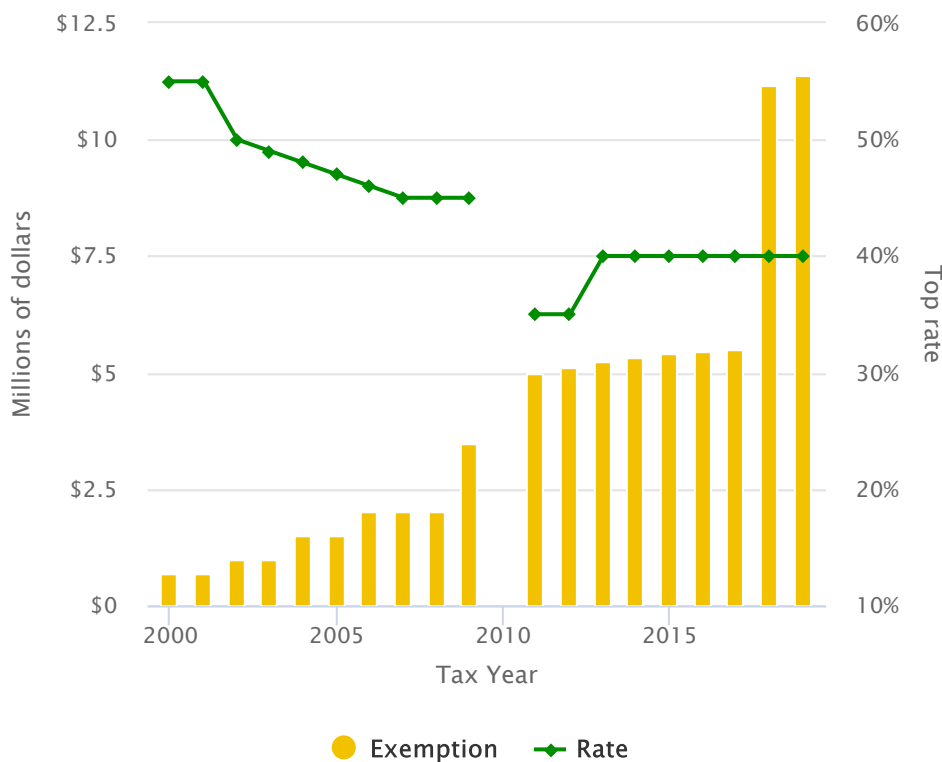
The Economic Growth and Tax Relief Reconciliation Act of 2001 (EGGTRA) scheduled a series of exemption increases, starting at $675,000 in 2001 and ending at $3.5 million in 2009 before temporarily repealing the tax entirely in 2010.[1] In addition, the top estate tax rate was lowered from 45 to 35 percent. EGGTRA's provisions were written with a "sunset clause" such that, in 2011, the estate tax would be re-introduced at its 2001 law parameters.

The American Taxpayer Relief Act (ATRA) of 2012 made permanent the $5.12 million exemption for 2012 and indexed it to inflation thereafter. ATRA also raised the top tax rate to 40 percent beginning in 2013. This increase in the top tax rate was the only revenue-raising change to the exemption or rate of the estate tax law over this period.

The permanent changes put in place by ATRA were temporarily modified under the Tax Cuts and Jobs Act (TCJA) in 2017. For tax years 2018 through 2025, the exemption was doubled to $11.4 million. After 2025, the exemption threshold reverts to the inflation-adjusted amount defined by ATRA (PWBM projects the value will be roughly $7 million).

Other Factors Affecting the Estate Tax

Structural forces in the economy affect tax revenues even when tax law is unchanged. For example, lower unemployment bolsters payroll tax revenues, inflation raises the nominal value of receipts, and real economic growth raises income taxes by pushing households into higher brackets.

The estate tax is unique in its sensitivity to certain nontax factors. First, it depends directly on the number of deaths, which in turn depends on the age distribution of the population. Second, unlike most federal taxes in

the US, the base of the estate tax is wealth rather than income. Wealth is more volatile than income due to the dynamic nature of financial markets.

We model the change in the estate tax (both liability and the number of taxable estate tax returns) as a function of changes in the following factors:

1. **Demographic changes.** Relative to 2000, the population is larger and older. Advances in public health and medicine have led to longer average lifespans.
2. **Economic changes.** Estate wealth generally grows with overall changes in asset prices, which we further decompose into inflationary gains and real price revaluations. Household saving—the amount households have after earning income, paying taxes, and spending on consumption—also affects wealth held at death. Lastly, inequality as measured by wealth shares has increased since 2000.
3. **Tax-related changes.** As discussed above, several rounds of tax legislation have cut effective estate tax rates since 2000. Sophisticated techniques to avoid estate taxes grew in popularity during this period, coinciding with a shrinking real IRS budget. Together, these factors may have reduced the amount of wealth subject to taxation.
4. **Unexplained factors.** Any remaining change in estate taxes since 2000 not explained by the above factors is considered "unexplained", represented as a residual.

The total effect on estate tax revenue becomes the aggregation of the above factors: (1A) Population growth, (1B) population aging, (1C) improved longevity, (2A) inflation, (2B) real asset price growth, (2C) real accumulation of assets, (2D) wealth concentration, (3A) tax cuts, (3B) tax planning, and (4) unexplained changes.

We measure the contribution of each factor by performing a shift-share analysis, a type of statistical exercise that isolates the impact of different forces causing a change to a variable over time. The model combines survey microdata on demographic characteristics and wealth, demographic-specific mortality rates from the CDC, financial flows data from the Federal Reserve, and estate tax data from the IRS to simulate estate tax microdata for tax years 2000-2019. We then measure the impact of a given factor by running the simulation and holding that sub-factor constant at its 2000 level. Refer to the Methodological Appendix below for further details.

Decomposing the Change in the Estate Tax

Figure 3 shows how much each factor contributed to (or subtracted from) the change in the estate tax since filing year 2001, both for liability and the number of taxable estates. Bars above zero represent factors that boosted estate tax liability and number of taxable estates, while bars below zero indicate factors that reduced estate tax liability and number of taxable estates. The results are *stacked*; that is, effects of a given factor are evaluated against a baseline that includes the effects of all factors listed above it in the stacking order. In this way, the contributions of all factors sum to the total change since filing year 2001.

Figure 3. Contributions to Change in the Estate Tax (Filing Years 2001-2020)

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◉ Estate tax liability (bil $)

○ Number of taxable estates (thousands)
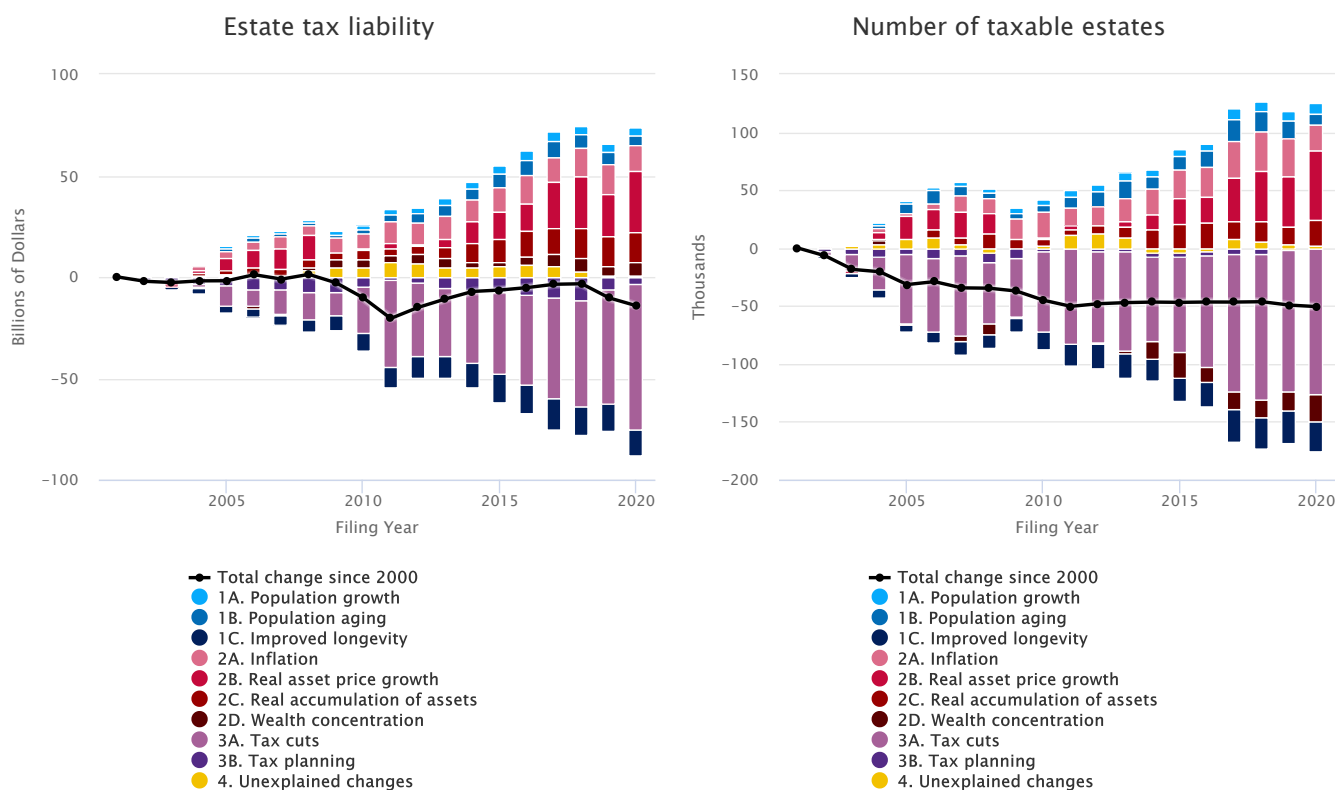
1. Demographic changes

The US population has grown larger and older since 2000 (factors 1A and 1B, respectively). These changes mechanically generate more taxable estates, all else equal. Figure 3 shows these factors were a steady, if relatively minor, boost to the federal estate tax.

On the other hand life expectancy has risen, leading to fewer deaths and thus lower estate tax revenue. Furthermore, the decline in mortality risk has been concentrated among those with more economic and social resources—the type of people most likely to be subject to the estate tax. Research based on administrative data shows that higher-income individuals are less likely to die at any age than lower-income individuals, and that this effect increased over the period from 2001 to 2014. Similarly, prior PWBM analyses have demonstrated a growing longevity premium to education. We rely on this research to estimate a trend in the reduction of mortality from higher income. We then simulate consequences from this longevity effect on estate taxes by holding mortality rates fixed at 2000 levels; see the Methodological Appendix for further detail.

2. Economic changes

The base of the estate tax is wealth held at time of death. Wealth can be decomposed into the number of assets that have been accumulated and their current market price.

Asset price changes can further be decomposed into inflationary and real components. Figure 3 shows that consumer price inflation (factor 2A), as measured by the PCE price deflator, was a steady boon for estate taxes throughout the period. Inflation averaged 1.9 percent from 2000 through 2019, falling below 0 just once and never reaching 3 percent. This effect increased nominal estate tax liability.

On the other hand, real asset revaluations (factor 2B) played a larger and higher-variance role. We calculate asset price changes as the inflation-adjusted change in the market value of household sector assets net of acquisitions; see the Methodological Appendix for details. Figure 3 shows how a correction in the stock market weighed on the estate tax after the dot-com bubble. Similarly, asset prices—most notably home prices—plummeted during the Great Financial Crisis, wiping out the cumulative positive contributions to the estate tax from the prior decade. The economic recovery and falling interest rates resulted in large capital gains across all asset classes in the 2010s, generating more estate tax liability and pushing more estates into taxable status.

During the period studied, real household market incomes and government deficits grew, each of which increases household sector saving all else equal. We calculate households' real accumulation of assets (factor 2C) as the residual change in wealth after accounting for inflation and real asset price revaluations. Figure 3 shows that household saving added to estate tax revenues.

Though the precise magnitude of wealth concentration (factor 2D) is debated, scholars agree that the distribution of wealth has grown more unequal over the previous two decades. The triennial Survey of Consumer Finances, the main data source for our simulation, shows that the share of wealth held by the bottom 90 percent of households fell from 30 percent in 2001 to 24 percent in 2019. At the same time, the share of wealth held by the top 1 percent rose 5 percentage points (from 32 to 37 percent).

Measured against a baseline where the 2000 tax code was in place (as in Figure 3 where tax changes are stacked), wealth concentration reduced the number of taxable estates—the result of lower wealth for those estates on the margin of the exemption. When measured against an actual-law baseline (not pictured in Figure 3), the result flips: higher average net worth for those in the top 1 percent pushed some estates over the higher exemption thresholds of the 2010s. In either case, trends in inequality over this period increased estate tax revenues, due to the progressive rate structure of the estate tax and the increased number of very wealthy estates.

3. Tax-related changes

Tax "avoidance" refers to a broad set of legal means through which taxpayers reduce their tax bill. In the context of the estate tax, avoidance includes strategic charitable giving and using trusts to minimize the taxable value of asset transfers. In contrast, tax "evasion" refers to illegal noncompliance activity like underreporting wealth on an estate tax return.

There is reason to believe that both avoidance and evasion have played a role in falling estate tax revenues since 2000. In 1990, changes were made to provisions in grantor-retained annuity trust (GRAT) law, which created a mechanism for sheltering large unrealized gains on assets from gift and estate tax purposes.[2] The use of GRATs has grown more popular since courts affirmed the vehicle's legal standing in 2000. One estimate suggests this form of tax planning has cost the federal government over $100 billion in forgone revenue.

A potential source of evasion is the underreporting of gifts. Some evidence suggests that over 80 percent of returns filed for gifts of over $1 million understated the true value of the gift. The IRS has limited capacity to

audit gift tax returns. This capacity was further constrained in 1997 with passage of the Taxpayer Relief Act (1997), which gives the IRS just three years to audit a gift tax return or accept it as filed. Well-known audit capacity limitations at the IRS encourage taxpayers to understate gifts on returns. This underreporting is likely further encouraged by the decline in real IRS funding since 2010. Despite increased workload (measured by returns filed), total staffing has declined over the past decade, and the audit rate on total returns has declined by 58 percent since 2010.

Tax avoidance and evasion are not easily observable and must be estimated. One approach is to compare observed gross estate on tax returns with the amount expected given the distribution of assets and mortality rates.[3] If wealth and the demographic attributes associated with mortality are measured consistently over time, a falling ratio of actual gross estate to expected gross estate indicates an increase in avoidance and/or evasion. Changes in the composition of estate tax returns over time, due to repeated increases in the exemption, present a practical complication for measurement because lower-value estate groups tend to have lower ratios. A regression that controls for estate composition reveals a statistically significant upward trend in avoidance and/or evasion, which we use to generate counterfactual scenarios where avoidance and evasion are held fixed at filing year 2001 levels (factor 3A). Figure 4 visualizes this trend by plotting the ratio of actual gross estate to expected gross estate and restricting the data to estates worth at least $5M through filing year 2018—a sample without selection bias.

Figure 4. Ratio of Actual Gross Estate to Expected Gross Estate (Filing Years 2001-2020)

Returns With More Than $5M in Gross Estate

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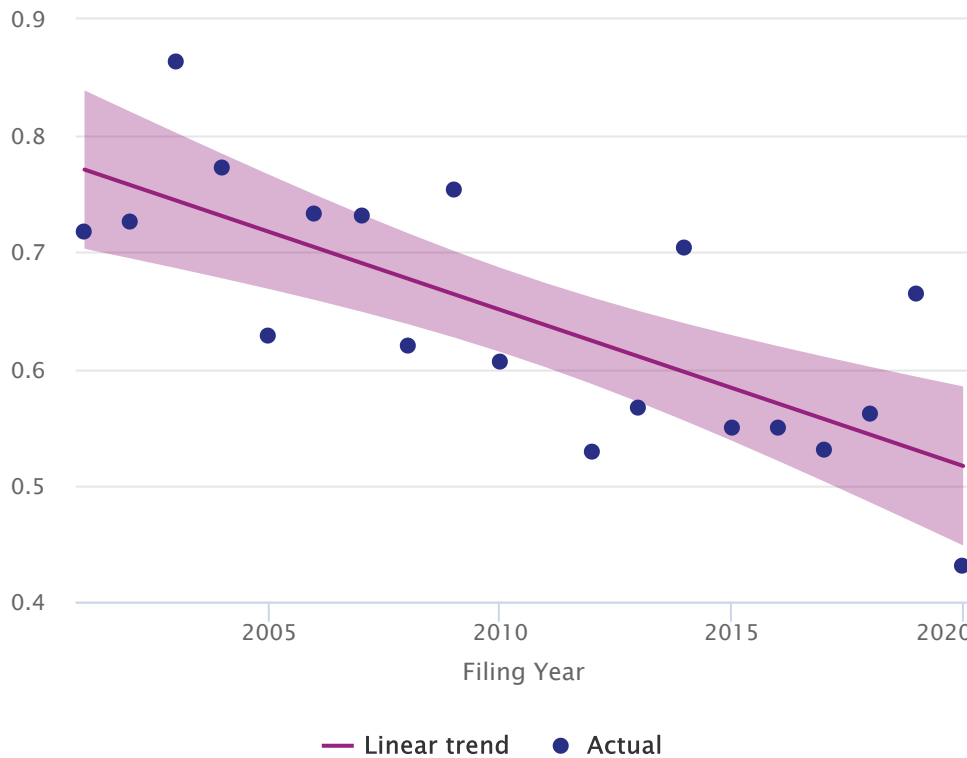
Our simulations suggest that tax planning acted as a modest drag on estate tax revenues over the last two decades. The quantitative magnitude of this estimate is more uncertain than that of other factors in this

analysis. Interpreting the mismatch between actual and expected gross estate as avoidance requires strong assumptions about the time-consistency of measurement error. If, for example, SCF respondents were more likely to overreport wealth in 2019 than in 2000, then the impact of avoidance is overstated. Nonetheless, we believe these assumptions are sensible for the exercise at hand, and that the estimates are consistent with the qualitative record.

Changes in tax law (factor 3B) played a much larger, and more certain, role in reducing estate tax liability and the number of taxable estates since tax year 2000. Figure 3 shows how changes in tax law contributed increasingly negatively to estate tax revenues over the period.

4. Unexplained factors

There remains a small difference between the sum of each factor's contribution and the actual change in estate tax liability (and taxable returns) since 2000. This residual may be attributable to how the Survey of Consumer Finances (SCF) microdata differentially interacts with modeling factors over time. The residual pattern appears correlated with SCF survey year, suggesting that triennial updates to the distributional content of our microdata are driving some of the discrepancy.

Counterfactual: What if 2000 Tax Rules Existed in 2019

A related but distinct question is: holding all else equal, how much larger would the estate tax be if the last 20 years of tax cuts never happened? Figure 5 plots estimated levels of estate tax liability and the number of taxable estates under a counterfactual scenario where estate tax parameters from 2000 remained in place through tax year 2019. We estimate that the number of taxable estates would have more-than-doubled over this period rather than the actual 98 percent decline. We estimate that the foregone nominal liability totals $649B over this period (roughly 0.2 percent of cumulative GDP).

Figure 5. Counterfactual 2000 Law Estate Tax Simulations (Filing Years 2001-2020)

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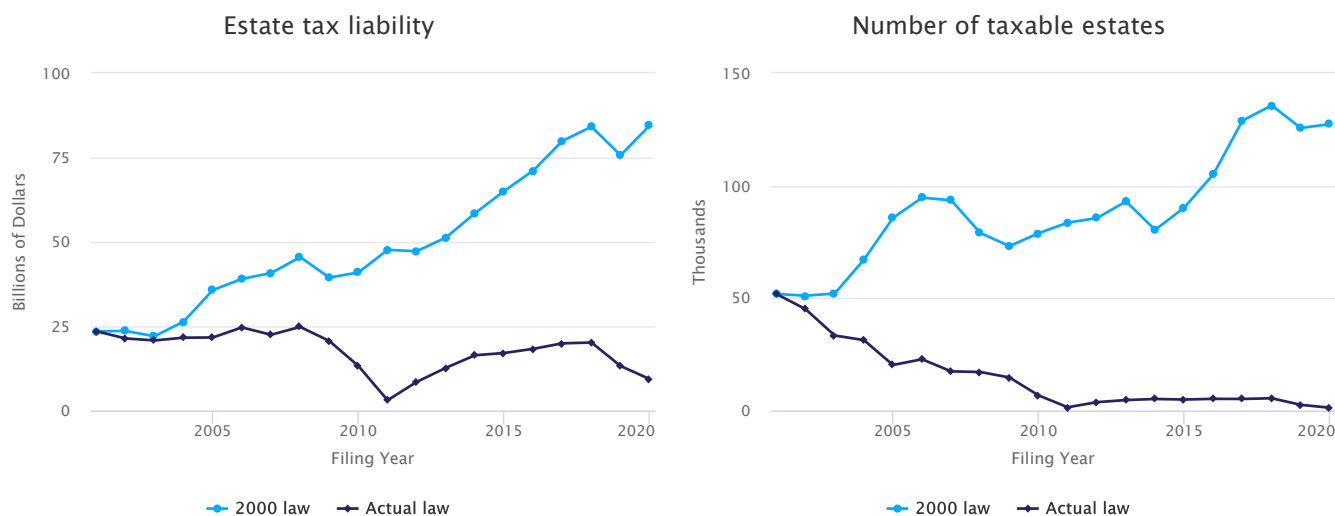
Methodological Appendix

This section provides details on data sources and methodology for the calculations presented in this brief.

Wealth holdings microdata construction

Our basic unit of analysis is simulated person-level wealth held at death. To construct this data, we begin with the Federal Reserve Board's Survey of Consumer Finances (SCF) Bulletin microdata. The SCF is a triennial survey of households and contains data on the composition of households' wealth holdings. We aggregate household assets into two categories: financial and nonfinancial assets. To get person-level data, we split married households by distributing 50 percent of total assets to the secondary spouse, the age of whom is assumed to be the same as that of the head.

Because the survey is only conducted every three years and our analysis requires annual data, we impute intra-year data. For each survey year at time t, we create copies of the dataset for years $t+1$ and $t+2$. Each person has a sample weight w and is categorized into a demographic group based on age and gender. Annualized population growth rates over the triennial period are calculated for a particular demographic group as:

$$\left(\frac{\sum w_{t+3}}{\sum w_t} \right)^{\frac{1}{3}} - 1$$

and are applied to w for each member of that group in years $t+1$ and $t+2$. We apply an identical calculation for the growth in average assets values by demographic group between survey years. The result is annual microdata.

Next, we benchmark asset values to those of the Financial Accounts (FA). (This benchmark is necessary because we use the FA data to decompose changes in total assets into saving and revaluations; see the section below for more detail.) Two steps are required to reconcile definitional scope across these data sources. First, we conform asset classification: consumer durables are removed from both sources; private business ownership is reclassified from nonfinancial to financial in the SCF; and defined benefit wealth is removed from the FA. Second, we remove the nonprofit sector from FA data. Asset values in our microdata are then scaled to match annual aggregates in the FA. The result is person-level annual microdata.

Mortality imputation

The next step in constructing estate microdata is to simulate death by assigning each record a probability of death and then multiplying it by sample weight. The starting point for mortality risk calculations is Centers for Disease Control (CDC) death records. We calculate the number of deaths by age, gender, and marital status and divide by respective population counts from the Current Population Survey (CPS), generating demographic-dependent mortality rates. Applying these mortality rates to our data, however, would overstate estate tax liability because richer people face lower mortality risk all else equal.

To account for an income premium in longevity, we draw on Online Data Table 16 from Chetty et al (2016) which breaks out mortality risk by age, gender, and income percentile (conditional on age and gender) for the years 2000-2014. We calculate a relative mortality advantage for each *unconditional* income group as:

$$\frac{m_{a,g,y,t}}{m_{a,g,t}} - 1$$

where m is mortality rate, a is age, g is gender, y is unconditional income percentile, and t is year. One complication is that our data requires a wealth-based mortality advantage while the source data is based on income, not wealth. This issue is in part mitigated by the fact that, in the Chetty et al (2016) data, for people aged 62 and older, income is defined as income at age 61 (because after retirement income becomes a weaker proxy for economic advantage). We assume that pre-retirement income percentile is a suitable proxy for wealth percentile when assigning mortality advantage.

One finding of that paper is that the mortality advantage of income is growing over time. Capturing this trend is important for our purposes: if we use a constant average of mortality advantage over the period, then the gap between actual gross estate and expected gross estate will be growing over time, falsely suggesting that avoidance and/or evasion are growing (see below for more detail.) We therefore estimate the trend using the following functional form:

$$\frac{m_{a,g,y,t}}{m_{a,g,t}} - 1 = \beta_0 + \beta_1\alpha + \beta_2\alpha^2 + \beta_3 g + \beta_4 y + \beta_5 t + \beta_6 gy + \beta_7 gt + \beta_8 yt + \beta_9 gyt + \varepsilon$$

such that the effect of income varies over time, which itself is mediated by gender. The effect of age on mortality advantage is confirmed to be nonlinear: income confers a larger advantage at younger ages, reflecting diminishing marginal returns to costly health interventions as age increases.

We fit values for mortality advantage by age, gender, income, and year and then apply them to the CDC-based demographic-specific mortality rates. The resulting mortality rates are used to generate the dataset of expected estates.

Tax calculation

The next step is to calculate estate tax liability. The IRS Statistics of Income (SOI) division offers annual aggregate data tables on estate tax variables by gross estate group and filing year. Critically, for each variable, the tables present dollar amounts as well as the number of returns with nonzero values. The latter allows us to determine the number of taxable estates, a key target in our analysis.

For our purposes the tables contain three key variables: gross estate (total assets of estates filing tax returns), taxable estate (the amount of wealth subject to tax after deductions, including liabilities and charitable gifts); and estate tax paid. For each gross estate group and year, we estimate tax parameters α, φ, and τ in the following set of equations relating SOI data to our microdata:

$$
\begin{aligned}
N_{total} &= \alpha_N \sum n \\
K_{gross} &= \alpha_K \frac{\sum nk}{\sum n} \\
N_{taxable} &= \varphi_N N_{total} \\
K_{taxable} &= \varphi_K K_{gross} \\
T &= \tau K_{taxable} N_{taxable}
\end{aligned}
$$

where N is the number of returns (total and taxable), K is average estate value (gross vs taxable), T is total estate tax liability; n is a record's death weight (its sample weight w times its mortality rate m) and k is a record's asset holdings. The parameters φ and τ, the taxable income rate and the effective estate tax rate respectively, can be interpreted as policy parameters. Their values largely reflect estate tax law including the exemption, rates, and allowable deductions. The parameter α, on the other hand, is a scaling factor that conforms gross estate in our calculations to the amount that actually appears on tax returns. It captures two factors. First, it includes any modeling error in our prediction of wealth at death which might arise from mismeasured wealth, inaccurate mortality risk, and more. Second, it captures the effect of avoidance and evasion of estate taxes. If the first factor is negligible, which we assume, then α can be interpreted as the effect of tax planning. Measurement error uncorrelated with time does not affect our estimates because the analysis focuses only on *changes* in the estate tax over time. Only if measurement error is changing over time will we introduce bias into the avoidance/evasion estimates.

Applying these tax parameters to our data gives us, by construction, totals for estate tax liability. The value of this type of parameterization is that it allows to simulate counterfactual scenarios for tax planning and tax policy, explained below.

Shift-share framework

To determine the extent to which each factor can explain the decline in estate taxes since 2000, we run counterfactual tax calculations under alternative model inputs. We begin by setting all factor parameters to their 2000 level. Then, one by one, we allow the factor's parameters to vary as they actually did over the period, *holding every other change up until this factor constant*. That is, factors are "stacked" on one another. The resulting difference between estate taxes when this factor is included versus excluded, in each year,

measures the marginal impact of that factor.[4] The difference between the actual change since 2000 and the sum of marginal factor effects is the unexplained variation.

What does it mean to set a factor to its 2000 level? The implementation varies by factor and is described below.

- **(1A) Population growth.** Sample weights are deflated by the ratio of total population in year t to population in 2000.

- **(1B) Population aging.** We calculate each age's share of the population in year t and in 2000. Sample weights are deflated by the ratio of those shares.

- **(1C) Improved longevity.** Mortality rates are set to their 2000 values (by age, gender, marital status, and income group).

- **(2A) Inflation.** Asset values are deflated by the PCE price deflator.

- **(2B) Real asset price growth.** Following Robbins (2018), we use FA data to measure asset price revaluations as the residual after subtracting net acquisitions from the change in the stock of assets. The calculation is done separately for financial and nonfinancial assets in the household and nonprofit sector. The cumulative growth in asset prices through year t is indexed to 2000, which we then deflate by PCE price deflator. This index is used to deflate asset prices in counterfactual scenarios.

- **(2C) Real accumulation of assets.** We hold all aforementioned factors at 2000 levels, then calculate the difference between actual gross estate. This approach measures the portion of inflation-adjusted savings accumulation not explained by demographic factors. We estimate the trend in savings through year t, index to 2000, and use this index to deflate asset prices in counterfactual scenarios.

- **(2D) Wealth concentration.** Records are assigned to asset percentile groups by year. We calculate each asset group's share of total assets in year t and in 2000. Sample weights are deflated by the ratio of those shares.

- **(3A) Tax cuts.** Tax parameters φ and τ are set to their 2000 levels.

- **(3B) Tax planning.** We estimate the following equation:

$$\ln(\alpha) = \beta_0 + \beta_1 \ln(K) + \beta_2 t + \beta_3 \ln(K)t + \varepsilon$$

The parameter estimates suggest richer estates engage in more avoidance/evasion; avoidance/evasion has been growing over time; and the trend in avoidance/evasion is less pronounced for richer estates (perhaps due to higher initial levels). We fit values of for each year and gross estate group, index to 2000, and deflate actual values of α by this value in counterfactual scenarios.

This analysis was prepared by John Ricco and Victoria Osorio under the direction of Richard Prisinzano. Alexander Arnon provided helpful feedback. Prepared for the website by Mariko Paulson.

1. While no federal estate tax applied to deaths in 2010, heirs of estates in this calendar year did not qualify for a full step-up in basis on their assets. Estates electing not to pay any estate tax could only receive a step up of up to $1.3 million. Those choosing step-up basis could opt in to paying the 2011 estate tax law. ↵

2. A GRAT is an irrevocable trust, an investment entity created to transfer assets to an heir after it has paid out a series of annuitized payments back to the grantor. The loophole exists because the present value of the annuity stream is calculated using the rate on U.S. Treasuries. If the assets in the trust grow faster than the rate on the UST, the gain on this asset stream is passed to the heir tax-free. ↵

3. Note that this measure does not capture every avoidance channel. For example, charitable giving is a deduction from gross estate and is independent of any relationship between expected gross estate and actual gross estate. ↵

4. Like all stacking analyses, the order in which factors are analyzed will affect the measured effect size. ↵