

ONLINE APPENDIX for "Taxing Billionaires: Estate Taxes and the Geographical Location of the Ultra-Wealthy" by Enrico Moretti and Daniel J. Wilson – Not For Publication

ONLINE APPENDIX A – Data Used in Cost-Benefit Calculations

In this appendix, we discuss the data that we use in section 6.3 to compute the costs and benefits of a broad-based estate tax on wealthy taxpayers. We use equations (3) and (4). We need state-by-state data or estimates on (1) the estate tax base ($(W_{as}N_{as})$ – i.e., the total wealth of all state residents with wealth above the exemption level, (2) the income tax base for potential estate taxpayers ($(Y_{as}N_{as})$ – i.e., the total income of all state residents with wealth above the exemption level, (3) the average effective tax rates on estate wealth (τ_s^W) and income (τ_s^Y) for potential estate taxpayers.

Estate tax base. In 2017, the federal estate tax applies to estate values above \$5.5 million for individuals and \$11 million for couples. Most current estate-tax states follow this federal exemption level, while some had lower exemptions. (The lowest is \$1 million in Massachusetts and Oregon (see Michael (2018))). In our calculations, we use for simplicity the same exemption threshold that applies U.S. federal estate tax and same degree of progressivity – except with a 16% top marginal rate, which is the top rate nearly all estate-tax states have currently.

To estimate the potential estate tax base in each state, we start with IRS Statistics on Income (SOI) data on total estate values reported on federal estate tax returns by state of residence.⁵⁶ Because the wealth by state on federal estate tax returns can be volatile from year to year, especially for small states, we use the average over 2015-2017 rather than just 2017. To fully utilize age-specific IRS data on income to wealth ratios discussed below, we apportion the statewide estate values to three broad age group (under 70, 70-79, and over 79) using national shares of estate tax returns by age group. Following the estate multiplier technique of Kopczuk and Saez (2004) and others, we estimate the underlying living population of wealthy taxpayers in each state by dividing the total estate values by the mortality rate for each age group from the Social Security Administration.⁵⁷ Given that mortality rates have been found to be considerably lower for the wealthy than for the general population, we adjust the mortality rates based on the mortality differentials provided in Saez and Zucman (2019).

⁵⁶<https://www.irs.gov/statistics/soi-tax-stats-estate-tax-statistics-filing-year-table-2>.

⁵⁷<https://www.ssa.gov/oact/STATS/table4c6.html>.

Income tax base. The income tax base for the population of potential estate taxpayers, by state and age group, can be estimated by multiplying the state-specific taxable estate tax values ($W_{as}N_{as}$) obtained above by the aggregate ratio of taxable income (Y_aN_a) to taxable estate value (W_aN_a) over all federal estate taxpayers: $Y_{as}N_{as} = W_{as}N_{as} \left(\frac{Y_aN_a}{W_aN_a} \right)$. The national aggregates of Y_aN_a and W_aN_a , by age group, are provided by the IRS Statistics on Income. Specifically, for 2008, the IRS matched all federal estate tax returns to the Form 1040 income tax returns filed by the decedent in the year prior to death. They report both taxable estate value and prior-year taxable income across taxpayers within each broad age group.⁵⁸ In aggregate, these taxpayers had taxable estate values of \$117.1 billion and prior-year taxable incomes of \$7.9 billion – an income/wealth ratio of 0.074. The ratio falls with age (due primarily to labor income falling sharply over these three age groups): It is 0.103 for those under 70, 0.071 for ages 70 to 79, and 0.058 for those over 79.

Average tax rates. For the average income tax rate, we use the top marginal tax rate, as we did in the previous section. Top income tax brackets among states generally start at incomes well below the income levels of individuals with wealth above the federal estate tax exemption (\$11 million for couples). Given that we seek to estimate the costs and benefits of states adopting an estate tax with the same degree of progressivity as the federal estate tax, albeit with a lower top rate (16%), we need to take account of this progressivity when estimating the average effective estate tax rate. To estimate this average rate, we multiply the top marginal rate in state estate taxes, 16%, by the ratio of the average tax rate to the top marginal tax rate in the federal estate tax. The federal top marginal rate in 2017 was 40%. The average effective tax rate, based on 2017 IRS SOI data on total estate tax payments as a percentage of taxable estate values (adjusted for spousal deductions), was 25%. Hence, we estimate the state average estate tax rate would be $16\% * (25/40) = 10\%$.

⁵⁸We add back spousal bequest deductions to taxable estate value because our cost estimates are based on revenues collected when the surviving spouse dies.

ONLINE APPENDIX B

Table B1:
Maximum Federal Credit Schedule for State Estate Taxes
1954-2001

Taxable Estate (\$)	Base Amount of Credit (\$)	Credit Rate on Excess (%)
100,000	0	0.8
150,000	400	1.6
200,000	1,200	2.4
300,000	3,600	3.2
500,000	10,000	4.0
700,000	18,000	4.8
900,000	27,600	5.6
1,100,000	38,800	6.4
1,600,000	70,800	7.2
2,100,000	106,800	8.0
2,600,000	146,800	8.8
3,100,000	190,800	9.6
3,600,000	238,800	10.4
4,100,000	290,800	11.2
5,100,000	402,800	12.0
6,100,000	522,800	12.8
7,100,000	650,800	13.6
8,100,000	786,800	14.4
9,100,000	930,800	15.2
10,100,000	1,082,800	16.0

Source: Bakija and Slemrod (2004), Table 1

Table B2: Probability of State Having an Estate Tax – Linear Probability Model

	(1)	(2)	(3)
	Estate Tax Indicator	Estate Tax Indicator	Estate Tax Indicator
Top PIT Rate	0.00697 (0.0228)	0.0119 (0.0243)	0.0486* (0.0282)
Top Corp. Income Tax (CIT) Rate	4.595* (2.480)	3.994 (2.576)	3.977 (3.187)
Log Change in real GDP	-0.0000390 (0.000357)	0.00000809 (0.000492)	-0.000148 (0.000322)
Top PIT Rate X post-2001	0.0157 (0.0231)	0.0116 (0.0234)	0.00390 (0.0211)
Top CIT Rate X post-2001	-1.116 (2.749)	-0.212 (2.919)	1.010 (3.066)
GDP Change X post-2001	-0.00000228 (0.000224)	0.000274 (0.000610)	0.000267 (0.000620)
Constant	0.0496 (0.343)	0.225 (0.409)	0.213 (0.323)
Observations	1333	1333	1333
State Fixed Effects	No	No	Yes
Year Fixed Effects	No	Yes	Yes

Standard errors (clustered by state) in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B3: Summary Statistics

Panel A. Individual-by-Year Observations. 1982 – 2017

	Mean	Median	Standard Deviation	Minimum	Maximum
Age	64.31	65.00	13.11	23.00	96.00
Net Worth (billions, 2017 dollars)	3.02	1.60	5.73	0.19	125.06
Observations	13432				

Panel B. Distribution of Net Worth – 2017

	1st	10th	25th	50th	75th	90th	99th
Net Worth (bill)	2.0	2.2	2.7	3.7	5.5	12.0	71.0

Panel C. State-by-Year Observations. 1982 – 2017

	Mean	Median	Standard Deviation	Minimum	Maximum
Population of Forbes 400	7.68	3.00	15.07	0.00	98.00
Net Worth (billions 2017 dollars)	22.63	5.86	53.36	0.00	617.80
Estate Tax Indicator	0.32	0.00	0.47	0.00	1.00
Top PIT Rate	4.86	5.40	2.96	0.00	14.10
Observations	1750				

Table B5: State of Deaths and State of Residence Reported by Forbes

Name	Death Year	Death State	Obituary Res. State	Forbes Res. State	Notes
Liliore Green Rains	1985	CA	CA	CA	
Mary Belin Du Pont Faulkner	1985	MA	MA	MA	
Abram Nicholas Pritzker	1986	IL		IL	
David Whitmire Hearst	1986	CA	CA	CA	
Gordon Barton Mclendon	1986	TX	TX	TX	
Howard Vollum	1986	OR	OR	OR	
Arnold Bernhard	1987	NY	NY/CT	CT	
Burton Green Bettingen	1987	CA	CA	CA	
Henry Ford II	1987	MI	MI	FL	
Henry John Heinz II	1987	FL	PA	PA	Died at winter home.
Paul Kalmanovitz	1987	CA	CA	CA	
Ruth Chandler Von Platen	1987	CA	CA	CA	
Sol Goldman	1987	NY	NY	NY	
John Wilmer Galbreath	1988	OH	OH	OH	
Lawrence Arthur Wien	1988	CT	CT/NY/FL	NY	
Pierre Samuel Du Pont	1988	DE	DE	DE	
Henry Crown	1990	IL	IL	IL	
Mark Goodson	1992	NY	NY	NY	
Edward John Debartolo	1994	OH	OH	OH	
Milton Jack Petrie	1994	NY	NY	NY	
Albert B Alkek	1995	TX	TX	TX	
Alpheus Lee Ellis	1995	FL	FL	FL	
Erskine Bronson Ingram	1995	TN	TN	TN	
James Lawrence Walton	1995	AR	FL	AR	Died on fishing trip.
John Jeffrey Louis	1995	IL	IL	IL	
Joseph R Coulter	1995	FL	FL	FL	
Walter A Haas	1995	CA	CA	CA	
Bob John Magness	1996	CO	VA		UVA hospital.
Daniel James Terra	1996	WA	IL/WA/France	IL	
David Packard	1996	CA	CA	CA	
Louis Larrick Ward	1996	MO	MO	MO	
Claude Bernard Pennington	1997	LA	LA	LA	
Herbert Allen	1997	NY	NY	NY	
Jack Kent Cooke	1997	DC	DC	VA	
Roberto Crispulo Goizueta	1997	GA	GA	GA	
Betsey Cushing Roosevelt Whitney	1998	NY	NY	NY	
Dwight Lyman Stuart	1998	CA	CA	CA	
John William Berry	1998	OH	OH	OH	
William Michael Cafaro	1998	OH	OH	OH	
Curtis Leroy Carlson	1999	MN	MN	MN	
Forrest Edward Mars Sr	1999	FL	FL	NV	
Henry Earl Singleton	1999	CA	CA	CA	
Jay Arthur Pritzker	1999	IL	IL	IL	
Leon Hess	1999	NY	NY	NJ	
Paul Mellon	1999	VA	VA	VA	
Ruth Ray Hunt	1999	TX	TX	TX	
Ted Arison	1999	Tel Aviv	Tel Aviv	FL	
Bill Daniels	2000	CA	CA	CO	Died in hospital.
Marshall Naify	2000	CA	CA	CA	
Randolph Apperson Hearst	2000	NY	NY	NY	
Edmund Wattis Littlefield	2001	CA	CA	CA	
Larry Fisher	2001	FL	FL/ NY	NY	
Malcom Purcell Mclean	2001	NY	NY	NY	
Michel Fribourg	2001	NY	NY	NY	
Reese Mcintosh Rowling	2001	TX	TX	TX	
William Redington Hewlett	2001	CA	CA	CA	
Alfred Lerner	2002	OH	OH	OH	
Kathryn Mccurry Albertson	2002	ID	ID	ID	
Millicent V Boudjadjji	2002	LA	LA	CA	
Robert Henry Dedman	2002	TX	TX	TX	
Victor Posner	2002	FL	FL	FL	
Walter Hubert Annenberg	2002	PA	PA/CA	PA	
Edward Lewis Gaylord	2003	OK	OK	OK	
Joan Beverly Kroc	2003	CA	CA	CA	
Laurence Alan Tisch	2003	NY	NY	NY	
Samuel Jayson LeFrak	2003	NY	NY	NY	
Charles B Benenson	2004	FL	NY	NY	Died suddenly.
Jay Van Andel	2004	MI	MI	MI	
Laurance Spelman Rockefeller	2004	NY	NY	NY	

Marvin Harold Davis	2004	CA	CA	CA	
Samuel Curtis Johnson	2004	WI	WI	WI	
Susan Thompson Buffett	2004	CA	WY	CA	Died on vacation.
Franklin Parsons Perdue	2005	MD	MD	MD	
Jackson Thomas Stephens	2005	AR	AR	AR	
Peter E Haas	2005	CA	CA	CA	
Preston Robert Tisch	2005	NY	NY	NY	
James R Cargill	2006	MN	MN	MN	
Lamar Hunt	2006	TX	TX	TX	
Margaret Anne Cargill	2006	CA	CA	CA	
Raymond J Noorda	2006	UT	UT	UT	
Robert Edward Rich	2006	FL	FL	FL	
Barbara Cox Anthony	2007	HI	GA/HI	HI	
Helen Walton	2007	AR	AR	AR	
James Martin Moran	2007	FL	FL	FL	
Margaret Hunt Hill	2007	TX	TX	TX	
James LeVoy Sorenson	2008	UT	UT	UT	
John Hugh Macmillan	2008	FL	FL	FL	
John Richard Simplot	2008	ID	ID	ID	
Carl Ray Pohlrad	2009	MN	MN	MN	
Frank Batten	2009	VA	VA	VA	
Melvin Simon	2009	IN	IN	IN	
Samuel J Heyman	2009	NY	NY, FL, CN	NY	Died after surgery.
Trammell Crow	2009	TX	TX	TX	
William Morse Davidson	2009	MI	MI	MI	
Dolph Briscoe	2010	TX	TX	TX	
John Werner Kluge	2010	VA	VA	FL	
Paul Milstein	2010	NY	NY	NY	
Richard N Goldman	2010	CA	CA	CA	
Cargill Macmillan	2011	CA	CA	CA	
Carl Henry Lindner	2011	OH	OH	OH	
Jack N Mandel	2011	OH	OH	OH	
Jean Ellen Du Pont Sheehan	2011	DE	DE	FL	
John Charles Haas	2011	PA	PA	PA	
John Edward Anderson	2011	CA	CA	CA	
Malcolm Green Chace	2011	MA	MA	RI	
Robert Alan Pritzker	2011	IL	IL	IL	
William Alfred Cook	2011	IN	IN	IN	
Albert Lee Ueltschi	2012	FL	FL	FL	
Donald J Schneider	2012	WI	WI	WI	
Barbara Piasecka Johnson	2013	Poland	Italy, Poland, Monaco	NJ	
Edgar Miles Bronfman	2013	NY	NY	NY	
Harold Clark Simmons	2013	TX	TX	TX	
Leonard Samuel Skaggs	2013	UT	UT	UT	
Robert Earl Holding	2013	UT		ID	Res. state unclear.
James Edwards Stowers	2014	MO	MO	MO	
Malcolm Glazer	2014	FL	FL	FL	
Nelson Bunker Hunt	2014	TX	TX	TX	
Patrick Joseph McGovern	2014	NH	CA	NH	
Kirk Kerkorian	2015	CA	CA	CA	
Michael Birck	2015	IL	IL	IL	
Ralph J Roberts	2015	PA	PA	PA	
Forrest Edward Mars Jr	2016	WY	WA	WY	
Jack Crawford Taylor	2016	MO	MO	MO	
Joseph C Mandel	2016	FL	OH	OH	Died at winter home.
Leandro Rizzuto	2017	FL	FL	WY	
Michael Ilitch	2017	MI	MI	MI	
Samuel Irving Newhouse	2017	NY	NY	NY	
Charles B Wang	2018	NY	NY	NY	

Table B4: Forbes 400 by Consolidated Metro Area (Top 40), 2017

City	Forbes Population in 2017	Mean Wealth in 2017 (mil)	1982-2017 Change in Forbes Population
Atlanta-Sandy Springs-Gainesville, GA-AL	9	4767	2
Austin-Round Rock-Marble Falls, TX	4	8025	4
Birchwood	1	4200	1
Bloomington, IN	1	7500	1
Boston-Worcester-Manchester, MA-RI-NH	8	5988	-2
Chicago-Naperville-Michigan City, IL-IN-WI	14	3443	-2
Columbia, MO	2	6800	2
Dallas-Fort Worth, TX	18	5950	-9
Denver-Aurora-Boulder, CO	4	9900	-1
Detroit-Warren-Flint, MI	3	4400	-1
Fayetteville-Springdale-Rogers, AR-MO	4	20375	3
Houston-Baytown-Huntsville, TX	11	4464	-10
Indianapolis-Anderson-Columbus, IN	2	2700	0
Jackson, WY	4	11700	4
Kalamazoo-Portage, MI	2	3950	0
Knoxville-Sevierville-La Follette, TN	2	3050	2
Las Vegas-Paradise-Pahrump, NV	7	7471	4
Los Angeles-Long Beach-Riverside, CA	31	4806	3
Miami-Fort Lauderdale-Pompano Beach, FL	25	4416	13
Milwaukee-Racine-Waukesha, WI	4	3800	3
Minneapolis-St. Paul-St. Cloud, MN-WI	2	4100	-5
Naples-Marco Island, FL	3	5033	2
Nashville-Davidson-Murfreesboro-Columbia, TN	4	4275	3
New York-Newark-Bridgeport, NY-NJ-CT-PA	80	6368	-9
Oklahoma City-Shawnee, OK	3	7867	-2
Omaha-Council Bluffs-Fremont, NE-IA	2	41100	1
Philadelphia-Camden-Vineland, PA-NJ-DE-MD	5	3500	-16
Phoenix-Mesa-Glendale, AZ	5	2780	5
Portland-Vancouver-Hillsboro, OR-WA	2	14450	0
Raleigh-Durham-Cary, NC	2	6700	2
Rochester-Batavia-Seneca Falls, NY	2	2850	2
San Diego-Carlsbad-San Marcos, CA	2	3750	-2
San Jose-San Francisco-Oakland, CA	54	8154	37
Santa Barbara-Santa Maria-Goleta, CA	2	4250	2
Seattle-Tacoma-Olympia, WA	8	29775	7
St. Louis-St. Charles-Farmington, MO-IL	2	5450	1
Tampa-St. Petersburg-Clearwater, FL	4	2375	3
Tulsa-Bartlesville, OK	2	5350	0
Washington-Baltimore-Northern Virginia, DC-MD-VA-WV	10	5490	4
Average	9	7470	1

Table B6: Robustness

Panel A. Difference-in-Difference

	(1)	(2)	(3)	(4)
	Top 100	Top200	Top300	10+ Obs
ET-state X post-2001	-0.553*** (0.105)	-1.307*** (0.195)	-1.902*** (0.388)	-2.182*** (0.522)
ET-state	0.0599 (0.199)	0.500 (0.318)	0.911* (0.466)	0.944*** (0.356)
Observations	1575	1610	1680	1575
Semi-elasticity	-.338	-.327	-.361	-.4
<i>Std. Error</i>	.064	.049	.073	.096

Driscoll-Kraay (with 10-year bandwidth) standard errors in parentheses.

All regressions include state and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B. Triple-Difference

	(1)	(2)	(3)	(4)
	Top 100	Top200	Top300	10+ Obs
ET-state X post-2001 X old	-0.762*** (0.166)	-0.808*** (0.265)	-1.127*** (0.346)	-1.178** (0.471)
ET-state X old	0.245*** (0.0779)	0.272*** (0.0749)	0.411*** (0.0990)	0.440** (0.188)
ET-state X post-2001	0.104 (0.0842)	-0.250* (0.130)	-0.388** (0.152)	-0.502** (0.240)
old X post-2001	0.893*** (0.121)	1.181*** (0.242)	1.603*** (0.301)	2.166*** (0.537)
ET-state	-0.0926 (0.0888)	0.114 (0.147)	0.250 (0.224)	0.252 (0.194)
old	-0.206*** (0.0586)	-0.352*** (0.0843)	-0.499*** (0.149)	-0.459* (0.244)
Observations	3150	3220	3360	3150
Semi-elasticity, Young	.036	-.086	-.133	-.173
<i>Std. Error</i>	.029	.045	.052	.083
Semi-elasticity, Old	-.603	-.465	-.49	-.499
<i>Std. Error</i>	.101	.085	.108	.13

Driscoll-Kraay (with 10-year bandwidth) standard errors in parentheses. All regressions include year fixed effects. State fixed effects are absorbed by old-young differencing.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel C. Linear Probability Model

	(1)	(2)	(3)	(4)
	Top 100	Top200	Top300	10+ Obs
Age X post-2001	-0.00563*** (0.000899)	-0.00362*** (0.000806)	-0.00295*** (0.000719)	-0.00337*** (0.000848)
Age	0.00273*** (0.000914)	0.00127** (0.000632)	0.000987* (0.000565)	0.00134** (0.000653)
Observations	3276	6465	9686	9714

Driscoll-Kraay standard errors in parentheses.

All regressions include state and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B7: Cost-Benefit Results Under Alternative Assumptions

Panel A: Billionaires Estate Tax

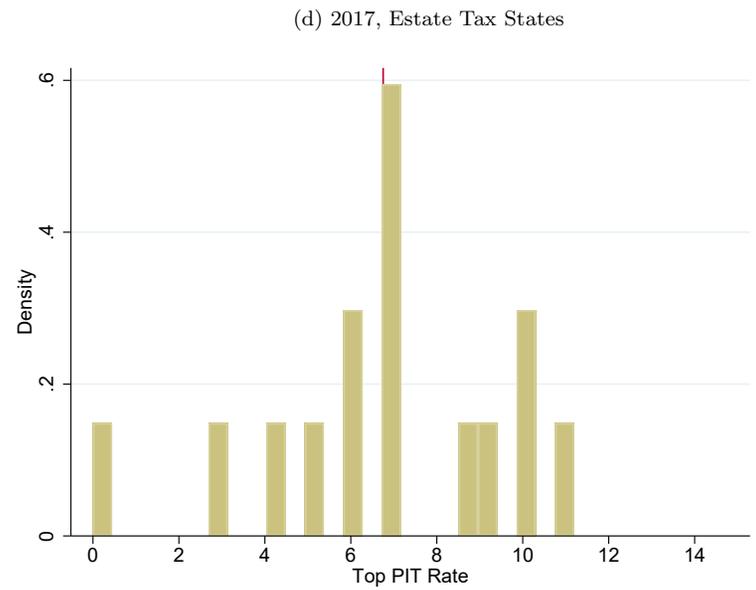
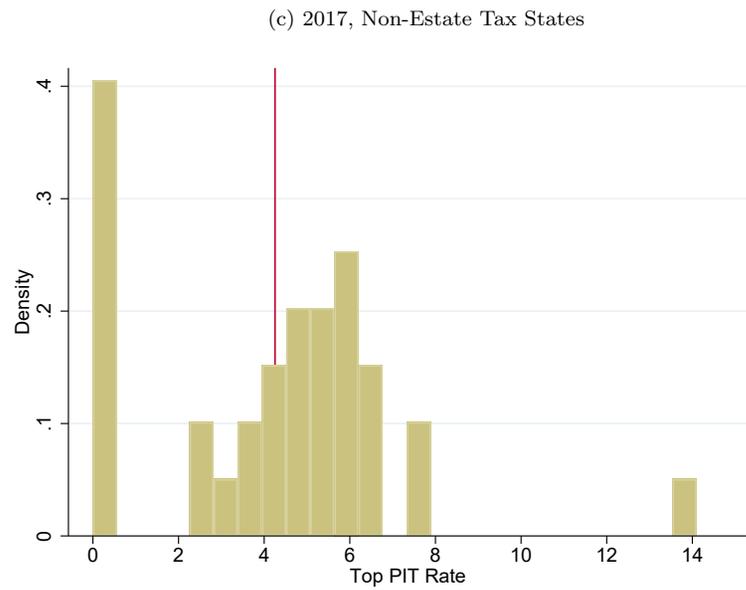
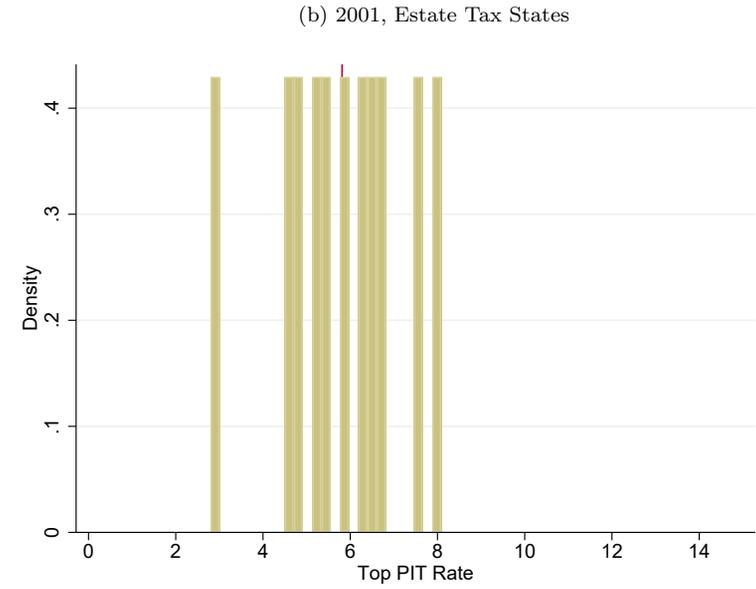
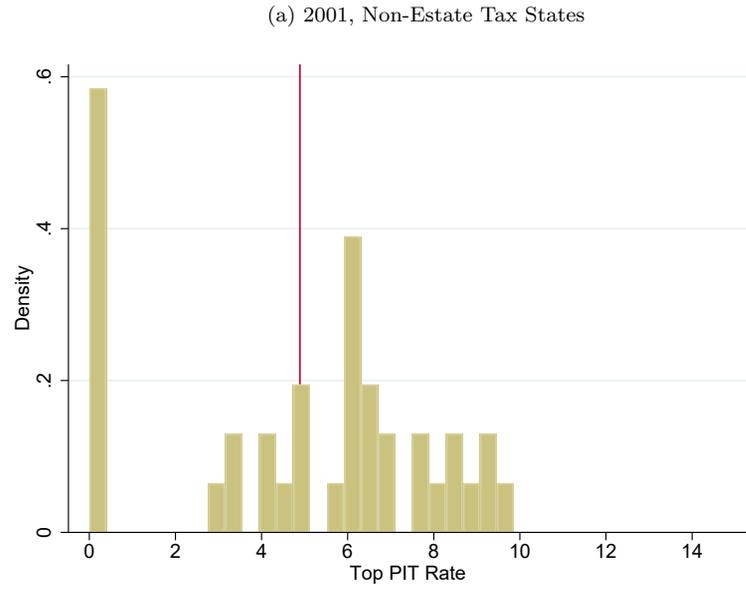
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
ET States (10)	.	.	.	.	.	.
Average CB ratio	0.49	0.18	0.73	0.41	0.58	0.23
Number with $CB \geq 1$	1.00	0.00	2.00	0.00	1.00	0.00
r4	.	.	.	.	.	.
Non-ET States (28)	.	.	.	.	.	.
Average CB ratio	0.31	0.13	0.48	0.27	0.35	0.14
Number with $CB \geq 1$	1.00	0.00	1.00	0.00	1.00	0.00
Average CB ratio	.	.	.	.	.	.
Number with $CB \geq 1$	.	.	.	.	.	.
r10	0.36	0.14	0.55	0.31	0.42	0.17
All States (38)	2.00	0.00	3.00	0.00	2.00	0.00

Panel B: Broad Estate Tax

	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
ET States (14)	.	.	.	.	.	.
Average CB ratio	0.71	0.28	1.05	0.61	0.83	0.71
Number with $CB \geq 1$	3.00	0.00	9.00	1.00	5.00	3.00
r4	.	.	.	.	.	.
Non-ET States (36)	.	.	.	.	.	.
Average CB ratio	0.45	0.18	0.66	0.38	0.52	0.45
Number with $CB \geq 1$	1.00	0.00	5.00	1.00	1.00	1.00
Average CB ratio	.	.	.	.	.	.
Number with $CB \geq 1$	.	.	.	.	.	.
r10	0.53	0.21	0.78	0.45	0.62	0.53
All States (50)	4.00	0.00	14.00	2.00	6.00	4.00

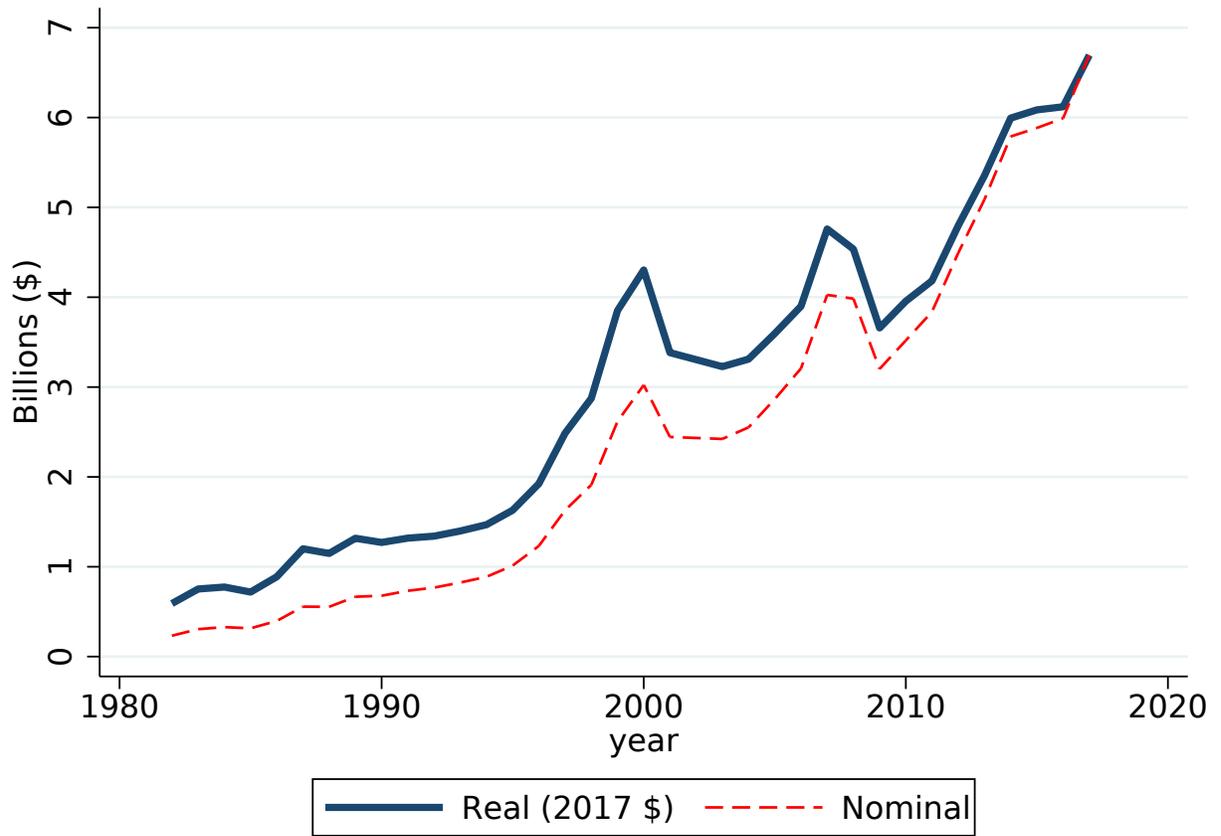
Notes: Cost-benefit ratios in Panel A exclude states that had no Forbes 400 billionaires in 2017. Baseline assumptions are described in the text. Alternative 1 assumes that wealth and income grow at 7.0% (vs. 0% in baseline) per year beyond 2017; 7.0% is the average annual growth rate of Forbes 400 real wealth from 1982–2017. Alternative 2 assumes surviving spouse is 20 (vs. 10) years younger than decedent. Alternative 3 assumes states discount using a real interest rate of 1% (vs. 2%). Alternative 4 assumes states discount using a real interest rate of 3%. Alternative 5, following [Saez and Zucman \(2019\)](#), assumes income of Forbes 400 is half of income reported by top 400 income taxpayers according to IRS SOI data (vs. assuming it is 10.3% of Forbes 400 taxable wealth). All other parameter assumptions are the same as in the baseline scenario.

Figure B1: Distribution of Top Personal Income Tax Rates by State Estate Tax Status



Note: red lines indicate means.

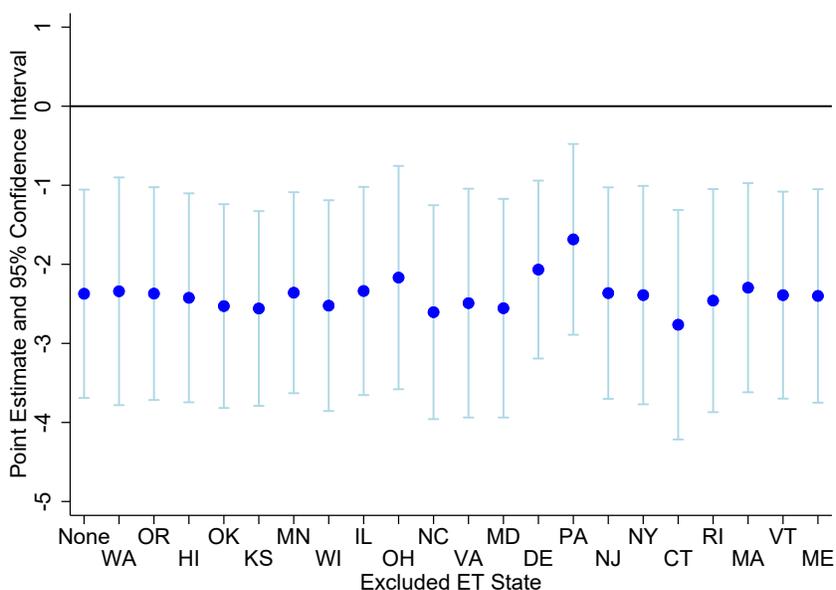
Figure B2: Average Wealth of Forbes 400 Sample (1982 to 2017)



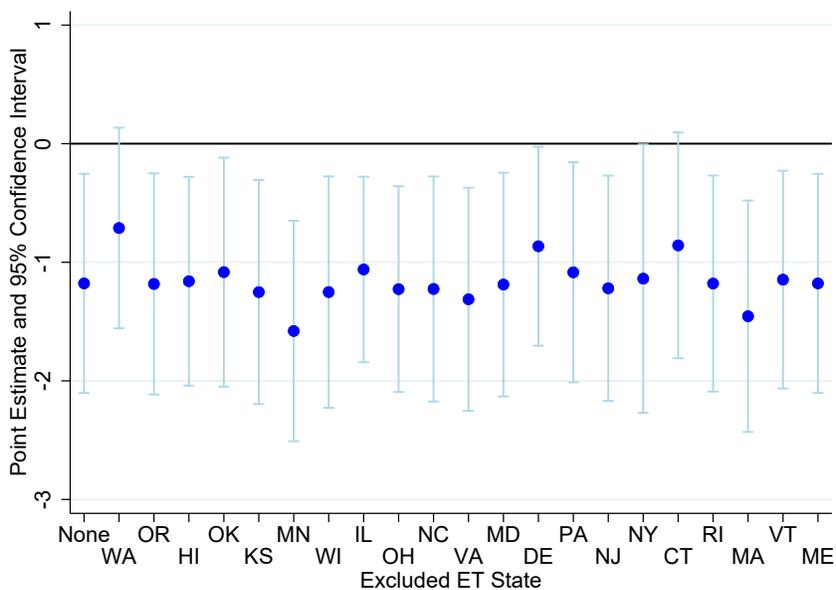
*Based on our sample of Forbes 400 individual-year observations, which excludes those with no data on age or state of residence.

Figure B3: Robustness to Dropping Individual ET States

Panel A. Difference-in-Difference



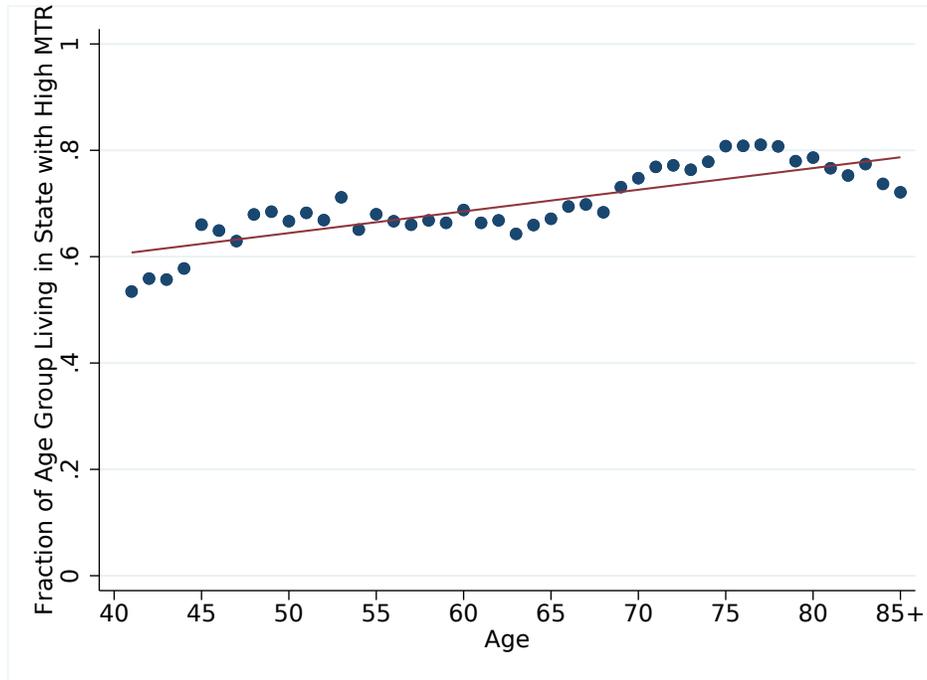
Panel B. Triple-Difference



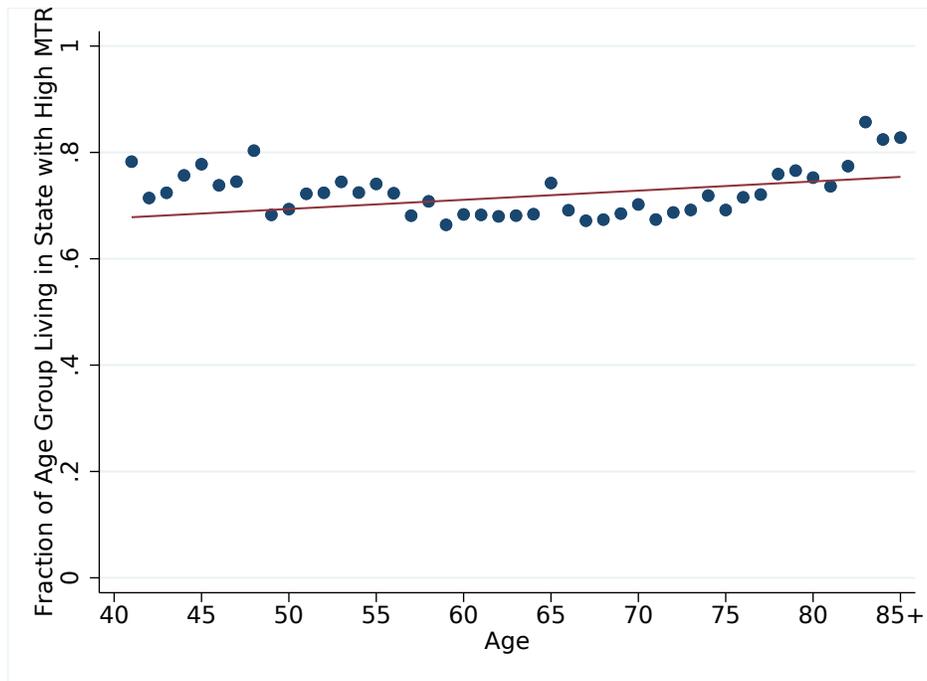
Notes: Panel A shows the estimated coefficient on EI_{xPost} , and its 95% confidence interval, from the difference-in-difference specification discussed in Section 5.1 dropping, one by one, each state that had an estate tax at some point after 2001. The leftmost coefficient, labeled “None”, corresponds the baseline estimate shown in Table 2. Point B shows the estimated coefficient on $EI_{xPostxOld}$, and its 95% confidence interval, from the triple-difference specification discussed in Section 5.2 dropping, one by one, each state that had an estate tax at some point after 2001. The leftmost coefficient, labeled “None”, corresponds the baseline estimate shown in Table 3.

Figure B4: Probability of living in High Income Tax State By Age

Panel A. 1982-2001

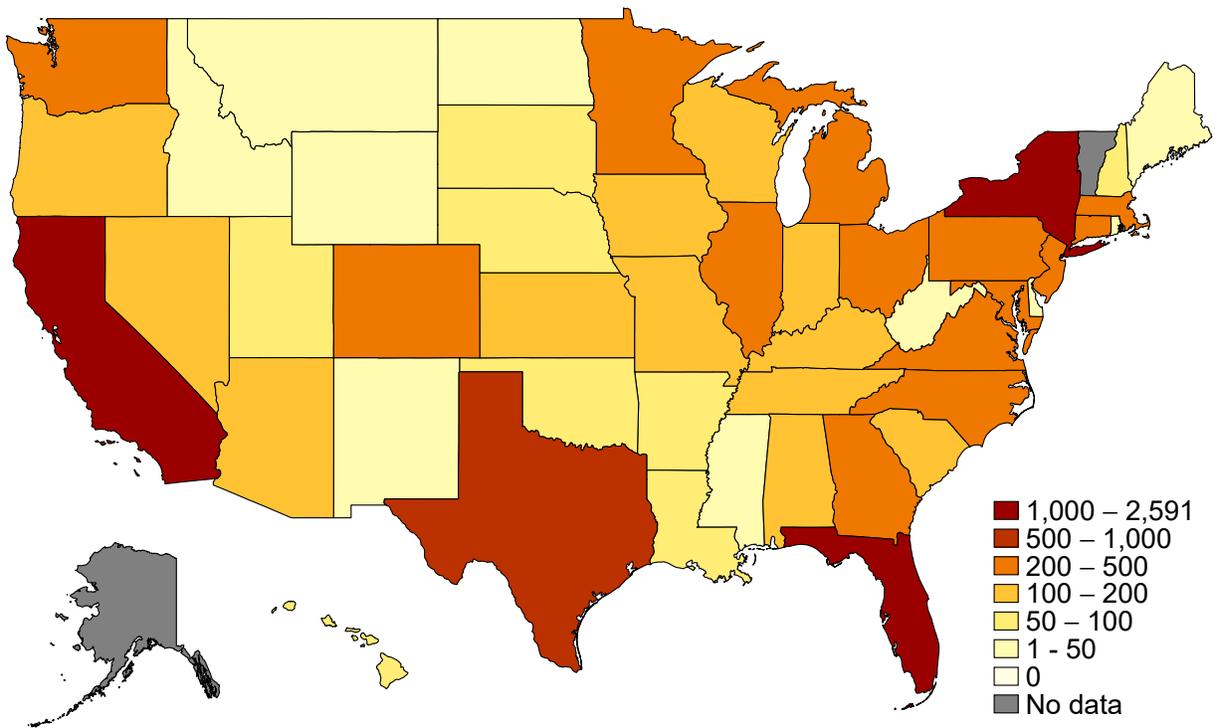


Panel B. 2005-2017



Notes: Age Groups below 40 are excluded. Individuals above 95 are pooled and displayed at Age 96.

Figure B5: Number of Federal Estate Taxpayers by State, 2017



Source: IRS Statistics on Income.