

Appendix for "Rethinking How We Score Capital Gains Tax Reform," Natasha Sarin, Lawrence Summers, Owen Zidar, and Eric Zwick, forthcoming in *Tax Policy and the Economy*, volume 36, edited by Robert Moffitt. Chicago: University of Chicago Press, 2022.

A Appendix Tables

Table A.1: Realization and Revenue Estimates for 2 p.p. and 20 p.p. Tax Increases, $e \in \{0, -0.5, -0.6, -0.62\}$

	CBO Projections Realiz. Rev.		e_{tax} : e_{NTR}	t = 22%								t = 40%							
				Realizations				Revenue				Realizations				Revenue			
				0	-0.5	-0.6	-0.62	0	-0.5	-0.6	-0.62	0	-0.5	-0.6	-0.62	0	-0.5	-0.6	-0.62
				0	2	2.4	2.5	0	2	2.4	2.5	0	2	2.4	2.5	0	2	2.4	2.5
2022	1,278	256		1,278	1,214	1,201	1,198	281	267	264	264	1,278	639	511	482	511	256	204	193
2023	1,275	255		1,275	1,211	1,198	1,196	280	266	264	263	1,275	638	510	481	510	255	204	192
2024	1,180	236		1,180	1,121	1,109	1,106	260	247	244	243	1,180	590	472	445	472	236	189	178
2025	1,130	226		1,130	1,074	1,062	1,060	249	236	234	233	1,130	565	452	426	452	226	181	170
2026	1,107	221		1,107	1,052	1,041	1,038	244	231	229	228	1,107	554	443	417	443	221	177	167
2027	1,108	222		1,108	1,053	1,042	1,039	244	232	229	229	1,108	554	443	418	443	222	177	167
2028	1,121	224		1,121	1,065	1,054	1,051	247	234	232	231	1,121	560	448	423	448	224	179	169
2029	1,144	229		1,144	1,087	1,075	1,073	252	239	237	236	1,144	572	458	431	458	229	183	173
2030	1,174	235		1,174	1,115	1,104	1,101	258	245	243	242	1,174	587	470	443	470	235	188	177
2031	1,210	242		1,210	1,150	1,137	1,135	266	253	250	250	1,210	605	484	456	484	242	194	182
SUM	11,727	2,345		11,727	11,141	11,023	10,996	2,580	2,451	2,425	2,419	11,727	5,864	4,691	4,421	4,691	2,345	1,876	1,768
		Δfrom baseline		0	-586	-704	-731	235	106	80	74	0	-5,864	-7,036	-7,306	2,345	0	-469	-577

Notes: All values are presented in billions of dollars. CG base taken from July 2021 CBO predictions for capital gains realizations over the next ten years (accessible at <https://www.cbo.gov/data/budget-economic-data> under "Revenue projections, by category"). We assume a starting tax rate of 20% to compute baseline total revenues. We calculate that percent change in realizations is equal to the product of the net-of-tax rate elasticity and the percent change in the net-of-tax rate (change in rate divided by initial net-of-tax rate). An analogous method using tax elasticities instead of net-of-tax rate elasticities yields identical results.

Table A.2: Realization and Revenue Estimates for 2 p.p. and 10 p.p. Tax Increases, $e \in \{0, -0.3, -0.4, -0.7\}$

			t = 22%								t = 30%								
			Realizations				Revenue				Realizations				Revenue				
			0	-0.3	-0.4	-0.7	0	-0.3	-0.4	-0.7	0	-0.3	-0.4	-0.7	0	-0.3	-0.4	-0.7	
			e_{tax} :																
			e_{NTR} :	0	1.2	1.6	2.8	0	1.2	1.6	2.8	0	1.2	1.6	2.8	0	1.2	1.6	2.8
CBO Projections	Realiz.	Rev.																	
2022	1,278	256		1,278	1,240	1,227	1,189	281	273	270	261	1,278	1,086	1,022	831	383	326	307	249
2023	1,275	255		1,275	1,237	1,224	1,186	280	272	269	261	1,275	1,084	1,020	829	382	325	306	249
2024	1,180	236		1,180	1,145	1,133	1,097	260	252	249	241	1,180	1,003	944	767	354	301	283	230
2025	1,130	226		1,130	1,096	1,085	1,051	249	241	239	231	1,130	960	904	734	339	288	271	220
2026	1,107	221		1,107	1,074	1,063	1,030	244	236	234	226	1,107	941	886	720	332	282	266	216
2027	1,108	222		1,108	1,075	1,064	1,030	244	236	234	227	1,108	942	886	720	332	283	266	216
2028	1,121	224		1,121	1,087	1,076	1,043	247	239	237	229	1,121	953	897	729	336	286	269	219
2029	1,144	229		1,144	1,110	1,098	1,064	252	244	242	234	1,144	972	915	744	343	292	275	223
2030	1,174	235		1,174	1,139	1,127	1,092	258	251	248	240	1,174	998	939	763	352	299	282	229
2031	1,210	242		1,210	1,174	1,162	1,125	266	258	256	248	1,210	1,028	968	786	363	309	290	236
SUM	11,727	2,345		11,727	11,375	11,258	10,906	2,580	2,503	2,477	2,399	11,727	9,968	9,382	7,623	3,518	2,990	2,814	2,287
	Δfrom baseline			0	-352	-469	-821	235	157	131	54	0	-1,759	-2,345	-4,104	1,173	645	469	-59

Notes: All values are presented in billions of dollars. CG base taken from July 2021 CBO predictions for capital gains realizations over the next ten years (accessible at <https://www.cbo.gov/data/budget-economic-data> under “Revenue projections, by category”). We assume a starting tax rate of 20% to compute baseline total revenues. We calculate that percent change in realizations is equal to the product of the net-of-tax rate elasticity and the percent change in the net-of-tax rate (change in rate divided by initial net-of-tax rate). An analogous method using tax elasticities instead of net-of-tax rate elasticities yields identical results.

Table A.3: Realization and Revenue Estimates for 2 p.p. and 10 p.p. Tax Increases, $e \in \{0, -0.5, -0.5, -0.62\}$

	CBO Projections Realiz. Rev.		e_{tax} : e_{NTR} :	t = 22%								t = 30%							
				Realizations				Revenue				Realizations				Revenue			
				0	-0.5	-0.6	-0.62	0	-0.5	-0.6	-0.62	0	-0.5	-0.6	-0.62	0	-0.5	-0.6	-0.62
0	2	2.4	2.5	0	2	2.4	2.5	0	2	2.4	2.5	0	2	2.4	2.5				
2022	1,278	256		1,278	1,214	1,201	1,198	281	267	264	264	1,278	958	895	880	383	288	268	264
2023	1,275	255		1,275	1,211	1,198	1,196	280	266	264	263	1,275	956	892	878	382	287	268	263
2024	1,180	236		1,180	1,121	1,109	1,106	260	247	244	243	1,180	885	826	812	354	266	248	244
2025	1,130	226		1,130	1,074	1,062	1,060	249	236	234	233	1,130	848	791	778	339	254	237	233
2026	1,107	221		1,107	1,052	1,041	1,038	244	231	229	228	1,107	830	775	762	332	249	232	229
2027	1,108	222		1,108	1,053	1,042	1,039	244	232	229	229	1,108	831	776	763	332	249	233	229
2028	1,121	224		1,121	1,065	1,054	1,051	247	234	232	231	1,121	841	785	772	336	252	235	232
2029	1,144	229		1,144	1,087	1,075	1,073	252	239	237	236	1,144	858	801	788	343	257	240	236
2030	1,174	235		1,174	1,115	1,104	1,101	258	245	243	242	1,174	880	822	808	352	264	247	242
2031	1,210	242		1,210	1,150	1,137	1,135	266	253	250	250	1,210	908	847	833	363	272	254	250
SUM	11,727	2,345		11,727	11,141	11,023	10,996	2,580	2,451	2,425	2,419	11,727	8,795	8,209	8,074	3,518	2,639	2,463	2,422
	Δfrom baseline			0	-586	-704	-731	235	106	80	74	0	-2,932	-3,518	-3,653	1,173	293	117	77

Notes: All values are presented in billions of dollars. CG base taken from July 2021 CBO predictions for capital gains realizations over the next ten years (accessible at <https://www.cbo.gov/data/budget-economic-data> under “Revenue projections, by category”). We assume a starting tax rate of 20% to compute baseline total revenues. Although we report estimates by elasticity, our calculations use net-of-tax rate elasticities. More precisely, we calculate that the percent change in realizations is equal to the product of the net-of-tax-rate elasticity and the percent change in the net-of-tax rate (change in rate divided by initial net-of-tax rate).

Table A.4: Realization, Dividend and Revenue Estimates for 2 p.p. and 20 p.p. Tax Increases, $e \in \{0, -0.3, -0.4, -0.7\}$

			t = 22%								t = 40%							
			Realizations and dividends				Revenue				Realizations and dividends				Revenue			
CBO Projections		e_{tax} :	0	-0.3	-0.4	-0.7	0	-0.3	-0.4	-0.7	0	-0.3	-0.4	-0.7	0	-0.3	-0.4	-0.7
Base	Rev.	e_{NTR} :	0	1.2	1.6	2.8	0	1.2	1.6	2.8	0	1.2	1.6	2.8	0	1.2	1.6	2.8
2022	1,572	314	1,572	1,525	1,509	1,462	346	335	332	322	1,572	1,100	943	472	629	440	377	189
2023	1,593	319	1,593	1,545	1,529	1,481	350	340	336	326	1,593	1,115	956	478	637	446	382	191
2024	1,511	302	1,511	1,466	1,451	1,405	332	322	319	309	1,511	1,058	907	453	604	423	363	181
2025	1,468	294	1,468	1,424	1,409	1,365	323	313	310	300	1,468	1,028	881	440	587	411	352	176
2026	1,450	290	1,450	1,406	1,392	1,348	319	309	306	297	1,450	1,015	870	435	580	406	348	174
2027	1,455	291	1,455	1,411	1,397	1,353	320	310	307	298	1,455	1,018	873	437	582	407	349	175
2028	1,474	295	1,474	1,430	1,415	1,371	324	315	311	302	1,474	1,032	884	442	590	413	354	177
2029	1,504	301	1,504	1,459	1,444	1,399	331	321	318	308	1,504	1,053	902	451	602	421	361	180
2030	1,551	310	1,551	1,504	1,489	1,442	341	331	328	317	1,551	1,086	931	465	620	434	372	186
2031	1,607	321	1,607	1,559	1,543	1,495	354	343	339	329	1,607	1,125	964	482	643	450	386	193
SUM	15,185	3,037	15,185	14,729	14,578	14,122	3,341	3,240	3,207	3,107	15,185	10,629	9,111	4,556	6,074	4,252	3,644	1,822
	Δfrom baseline		0	-456	-607	-1,063	304	203	170	70	0	-4,556	-6,074	-10,629	3,037	1,215	607	-1,215

Notes: All values are presented in billions of dollars. CG base taken from July 2021 CBO predictions for capital gains realizations and dividends over the next ten years (accessible at <https://www.cbo.gov/data/budget-economic-data> under “Revenue projections, by category”). We assume a starting tax rate of 20% to compute baseline total revenues. We calculate that percent change in realizations is equal to the product of the net-of-tax rate elasticity and the percent change in the net-of-tax rate (change in rate divided by initial net-of-tax rate). An similar method using tax elasticities instead of net-of-tax rate elasticities yields identical results.

B A model of capital gains realizations

This appendix describes and updates the asset turnover model in [Auerbach \(1989\)](#), which we use to relate capital gains elasticities to changes in investor behavior. The two key parameters are f , which is the fraction of assets that never face capital gains, and δ , which is the fraction of assets that face capital gains and are sold every year. The main idea is that a given change in capital gains realizations can be related to changes in these two parameters, which represent investors holding assets until death and asset turnover frequency.

We need to define a few more variables to relate capital gains realizations G_t in to these two key parameters. The nominal value of assets sold in year t is denoted a_t , and g is the annual growth rate of asset value (and output growth). With these components, we can express capital gains realizations G_t as the sum of accumulated gains from assets held at different durations:

$$G_t = g\delta a_{t-1} + [(1+g)^2 - 1]\delta(1-\delta)a_{t-2} + [(1+g)^3 - 1]\delta(1-\delta)^2 a_{t-3} + \dots \quad (1)$$

[Auerbach \(1989\)](#) shows that one can express the steady-state ratio of realizations to sales at each date:

$$\frac{G}{a} = \frac{g}{g + \delta}. \quad (2)$$

As [Auerbach](#) argues, the total value of assets ever sold S is sum of those last realized one year ago, at current value, $(1+g)a_{t-1}$ plus those two years ago, at current value, $(1+g)^2(1-\delta)a_{t-2}$, plus those three years ago, at current value, $(1+g)^3(1-\delta)^2 a_{t-3}$, etc. Given the steady state condition that $a_t = (1+g)a_{t-1}$, the sum $S = a_t + (1-\delta)a_{t-1} + (1-\delta)^2 a_{t-2} + \dots = \frac{a_t}{\delta}$. Since a fraction f of all assets are never realized, this result (i.e., $A = (1-f)\frac{a_t}{\delta}$) and [equation 2](#) imply that the ratio of gains to assets each year is:

$$\frac{G}{A} = (1-f)\frac{g\delta}{g + \delta} \quad (3)$$

Thus, the ratio of realized gains to the total value of assets that are ever sold is a function of our two main parameters f and δ , as well as the rate of growth g . We cannot observe f and g directly, but we can re-arrange these expressions to estimate them using nominal rates of return, the ratio of gains to sales, and the ratio of gains to assets. Specifically, we can rewrite [equation 2](#) and [3](#):

$$\delta = \frac{g(1 - \frac{G}{a})}{\frac{G}{a}} \quad (4)$$

$$f = 1 - \frac{\frac{G}{A}(g + \delta)}{g\delta} \quad (5)$$

[Auerbach \(1989\)](#) sets $g = .1$ and estimates that $\frac{G}{A} = 0.033$ and $\frac{G}{a} = 0.303$. The resulting estimates using inputs from the late 1970s and early 1980s give $\delta = 0.23$ and $f = 0.526$, suggesting that half of assets never face capital gains, and those that do turn over roughly every four years.

Updating the inputs to this calculation gives slightly higher estimates of δ and similar estimate of f . If we set $g = .06$ based on nominal annual wealth growth since 1990, $\frac{G}{A} = .0257$, and $\frac{G}{a} = 0.158$, then we get updated estimates $\hat{\delta} = .32$ and $\hat{f} = .49$.³³

2.1 Using model to quantify implications of elasticity estimates for δ and f

Taking log differences of [3](#), gives an expression for log changes in the realizations in terms of parameters:

$$\Delta \ln G = \Delta \ln(1-f) + \Delta \ln\left(\frac{g\delta}{g + \delta}\right) + \Delta \ln A \quad (6)$$

We can use this expression to relate our parameters to capital gains realization elasticities, (i.e., $e = \frac{\Delta \ln G}{\Delta \ln \tau}$) with respect to capital gains tax rates τ . For a change in tax rates and a given elasticity, the change in realizations

³³Note that $\frac{G}{A} = .0257$ is the ratio of realized gains divided by household public and private equity holdings plus real estate wealth less housing wealth. For $\frac{G}{a} = 0.158$, we use the ratio of net gains to sales price in [Table 1C](#), which has long term gains in 2010. <https://www.irs.gov/pub/irs-soi/soi-a-inca-id1604.pdf>

is $\Delta \ln G = e \times \Delta \ln \tau$. Using this expression allows us to go from an elasticity value and a tax change to see how much f and δ might have to change.

$$e \times \Delta \ln \tau = \Delta \ln(1 - f) + \Delta \ln \left(\frac{g\delta}{g + \delta} \right) + \Delta \ln A \quad (7)$$

Quantitatively, we can start with the updated calibration values described above: $f_0 = .49$ and $\delta_0 = .32$, $g = .06$ as a baseline. Consider a capital gains tax rate increase that increases rates from $\tau_0 = .22$ to $\tau_1 = .396$, so $\Delta \ln \tau \approx 60\%$.³⁴ With an elasticity of -0.7 , the left-hand-side is $e = -0.7 \times .6 = -0.42$, which means that gains would fall by 42%. Applying equation 7, we can obtain this decline by 42% through changes in f , δ , or some combination (assuming, for simplicity, that $\Delta \ln A = 0$). Using only changes in f , we'd need $\Delta \ln(1 - f) = -0.42 \Rightarrow f_1 = .66$. In other words, if all the response to the tax increase came from changes in f , the share of gains that are held until death would have to increase by 17 percentage points from an initial level of $f_0 = .49$. Using only changes in δ , we'd get $\delta_1 = .075$, which is a substantial decline in asset turnover frequency relative to an initial value of $\delta_0 = .32$. With an elasticity of $e = -0.3$, the percentage point increase in f would be half as large (i.e., the increase would be 8.5 p.p.), and the value of $\delta_1 = .15$ would be twice as high.

³⁴Note that this stylized calculation abstracts from state capital gains tax rates as well as other tax interactions.