

Investment Taxation and Portfolio Performance

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Why is Investment Taxation Important?

Asset pricing has largely ignored tax implications of stock returns

Main focus has been on trading costs and risk

Large proportion of stocks are estimated to be held in taxable accounts

Magnitude of taxes is too large to ignore

What Does our Paper Accomplish?

- Documentation of after-tax stock index performance
 - Utilize various indices/portfolios
 - Utilize various investor income levels
- We show that portfolio characteristics and “style” induce taxation costs beyond that implied by dividend taxes.
 - Two sources of heterogeneity in tax burden
 - Heterogeneity based on dividend level
 - Heterogeneity based on capital gains realization
- We measure the impact “tax timing,” and show that the benefits are related to portfolio type.

How Important are our Results?

For a value-weighted index of NYSE stocks

95th percentile AGI investor has 13.19% lower performance than a tax-exempt investor

99.5th percentile AGI investor has 19.28% lower performance than a tax-exempt investor

For an equal-weighted index of NYSE stocks

95th percentile AGI investor has 14.56% lower performance than a tax-exempt investor

99.5th percentile AGI investor has 21.73% lower performance than a tax-exempt investor

How Important are our Results?

Current finance research identifies 3 sources of priced risk

Market return minus riskless returns

Small minus big market capitalization returns

Value minus growth capitalization returns

For an investor with an AGI in the 95th percentile, compared to the market risk premium

Historically,

Tax burden of small minus big capitalization premium is 2.8 times greater

Tax burden of value minus growth premium is 16.6 times greater

Based on the 2000 tax code

Tax burden of small minus big capitalization premium is 2.3 times greater

Tax burden of value minus growth premium is 3.2 times greater

Benefits of Deferral

A preferred capital gains realization strategy is to defer gains and to immediately realize losses.

The expected benefit of deferral

r -- expected return from an asset

t -- tax rate on realized capital gains.

Consider an investor with \$1.

Benefits of Deferral

For an investor who realizes capital gains every period, the expected terminal wealth after n periods, will be,

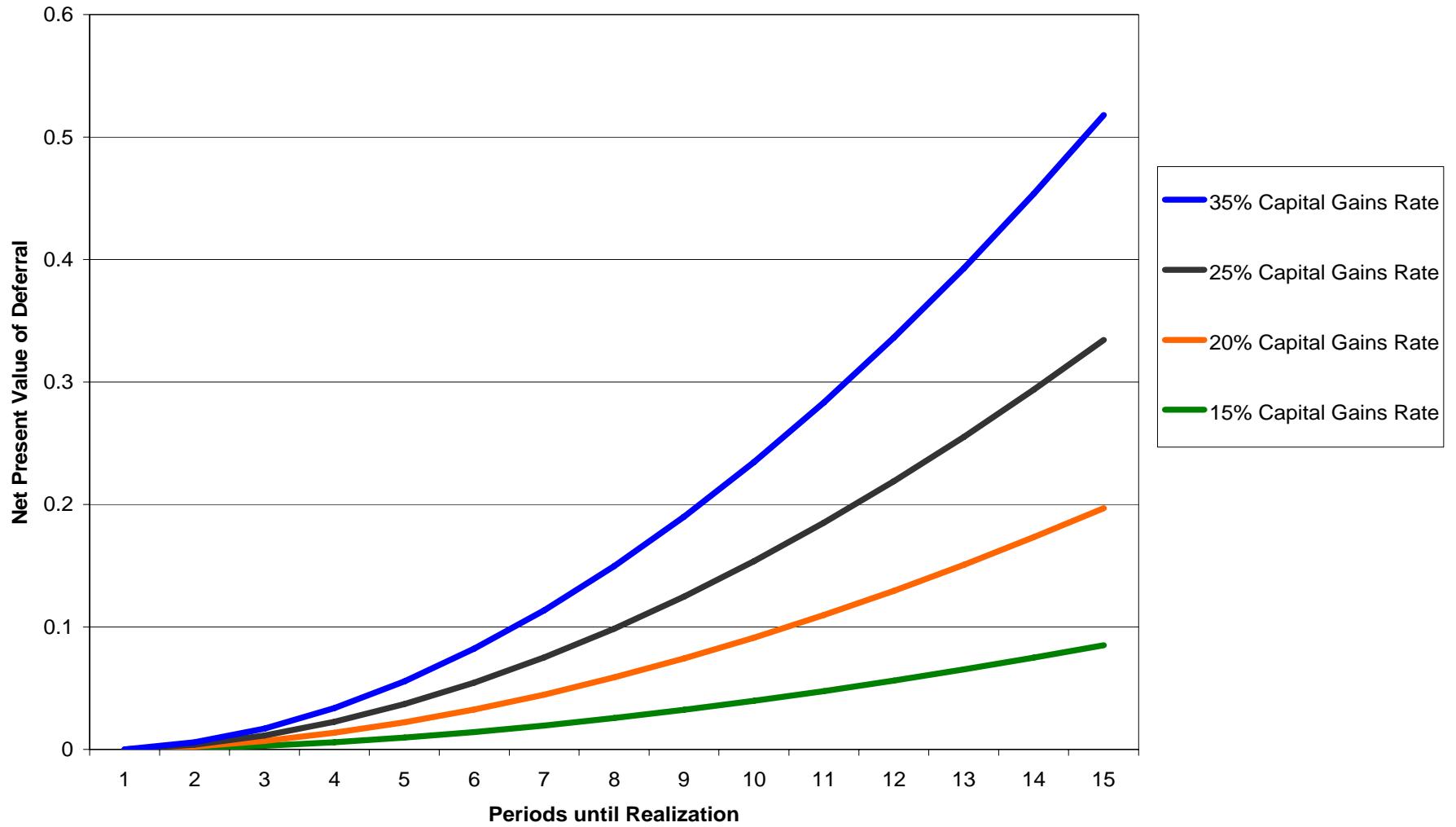
$$W_{real} = (1 + r(1 - t))^n .$$

For an investor who defers realization, terminal wealth W_{def} of the \$1 investment will be

$$W_{def} = (1 + r)^n - t((1 + r)^n - 1)$$

Because deferring capital gains is valuable, investment performance is improved when securities with a loss are sold, as opposed to securities with a gain.

Figure 1. Net Present Value of Capital Gains Deferral
Assuming an expected return of 9.76% per period



Style and Deferral

Portfolio strategies that hold winners and/or sell losers tend to be tax-efficient with respect to capital gains.

Value weighted—buy and hold, little turnover.

Growth—good performers are still growth.

Large market capitalization—good performers are still large cap.

Style and Deferral

Portfolio strategies that sell winners and/or buy winners tend to be tax-inefficient.

Equal weighted—buy losers, sell winners

Value—good performers sold upon becoming growth.

Small market capitalization—good performers sold upon becoming large cap.

Realization Rules

The portfolios are rebalanced tax efficiently

We track the basis series for each position

For *long* portfolios the *highest* basis positions are sold first

For *short* portfolios the *lowest* basis positions are sold first

Long portfolios generate no cashflows—net of taxes all dividends and distributions are reinvested.

A cashflow is added (or withdrawn) from short portfolio at the end of each period, which equates the portfolio values.

Simplifying Assumptions

Taxes are calculated and paid every month.

Investors have an unlimited, full deduction on

Capital Losses

Short Dividends

No State Taxes

No phase-outs of deductions or AMT constraints

Performance Measurement

Portfolio Value. The total dollar value of the portfolio, not considering the tax liability from portfolio liquidation.

Liquidation Value. The total dollar value of the portfolio, if the portfolio were liquidated and taxes were paid.

Overhang. The percentage tax liability associated with the portfolio.

$$\text{Overhang} = (\text{Portfolio Value} - \text{Liquidation Value}) / \text{Portfolio Value}$$

Portfolio Returns— Annualized (multiplied by 12)

Performance Measurement

$$Value_t = Liquidation\ Value_t + 0.07(Portfolio\ Value_t - Liquidation\ Value_t)$$

For long portfolios, $Return = \ln(Long\ Value_t) - \ln(Long\ Value_{t-1})$

For short portfolios, $Return = \ln(Short\ Value_t + Cashflow_t) - \ln(Short\ Value_{t-1})$

For long-short portfolios,

$$Return = \ln(Long\ Value_t - (Short\ Value_t - Short\ Value_{t-1} + Cashflow_t)) - \ln(Long\ Value_{t-1})$$

Portfolio Types

Large Cap—Stocks with market cap in the top 20%

Small Cap—Stocks with market cap in the bottom 20%

Value—Stocks with book-to-market in the top 20%

Growth—Stocks with book-to-market in the bottom 20%

No Dividend—Stocks that did not pay dividends in the previous year

Low Dividend—Stocks that paid a below median dividend in the previous year

High Dividend— Stocks that paid an above median dividend in the previous year

Plus Fama-French long-short portfolios,

HML, Value minus Growth

SMB, Small minus Big Market Capitalization

VWRET-RF, Market Risk Premium

Portfolio Types

Each portfolio requires an assumption about the tax bracket of the investor.

We consider investor's at the following percentile of the ordinary income.

Year	CPI adjustment factor	Income percentiles, in 2000 dollars					
		90 th	95 th	99 th	99.5 th	99.9 th	99.99 th
1940	12.29	32,521	38,311	88,255	134,219	350,361	1,119,860
1970	4.44	71,352	88,771	162,919	220,267	394,825	885,756
2000	1.00	87,334	120,212	277,983	397,949	1,134,849	5,349,795

We use the tax rates that correspond to the appropriate income level in constructing portfolio returns

Figure 2.
Equal-weighted self-financed tax-optimized portfolio value

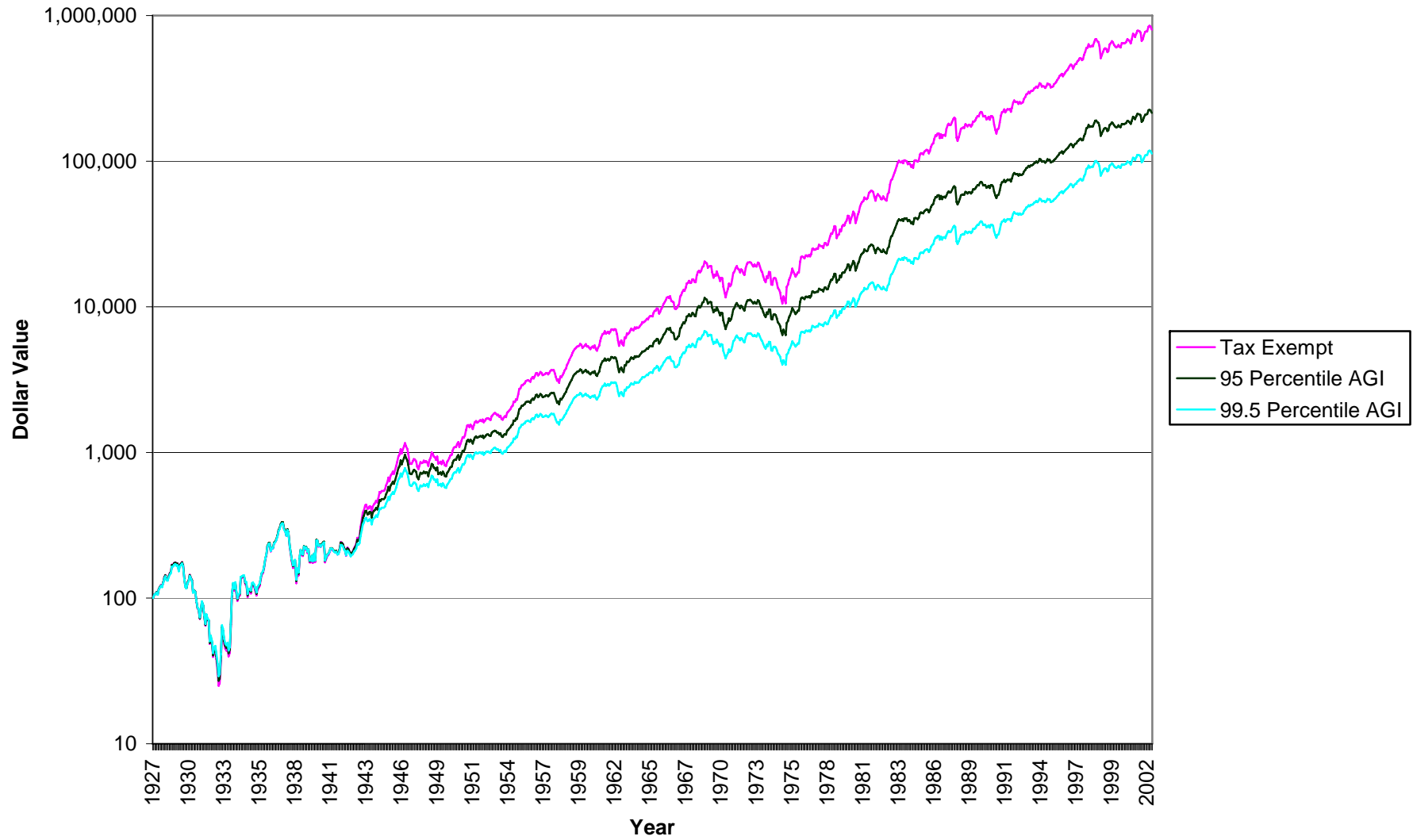


Figure 3.
Value-weighted self-financed tax-optimized portfolio value

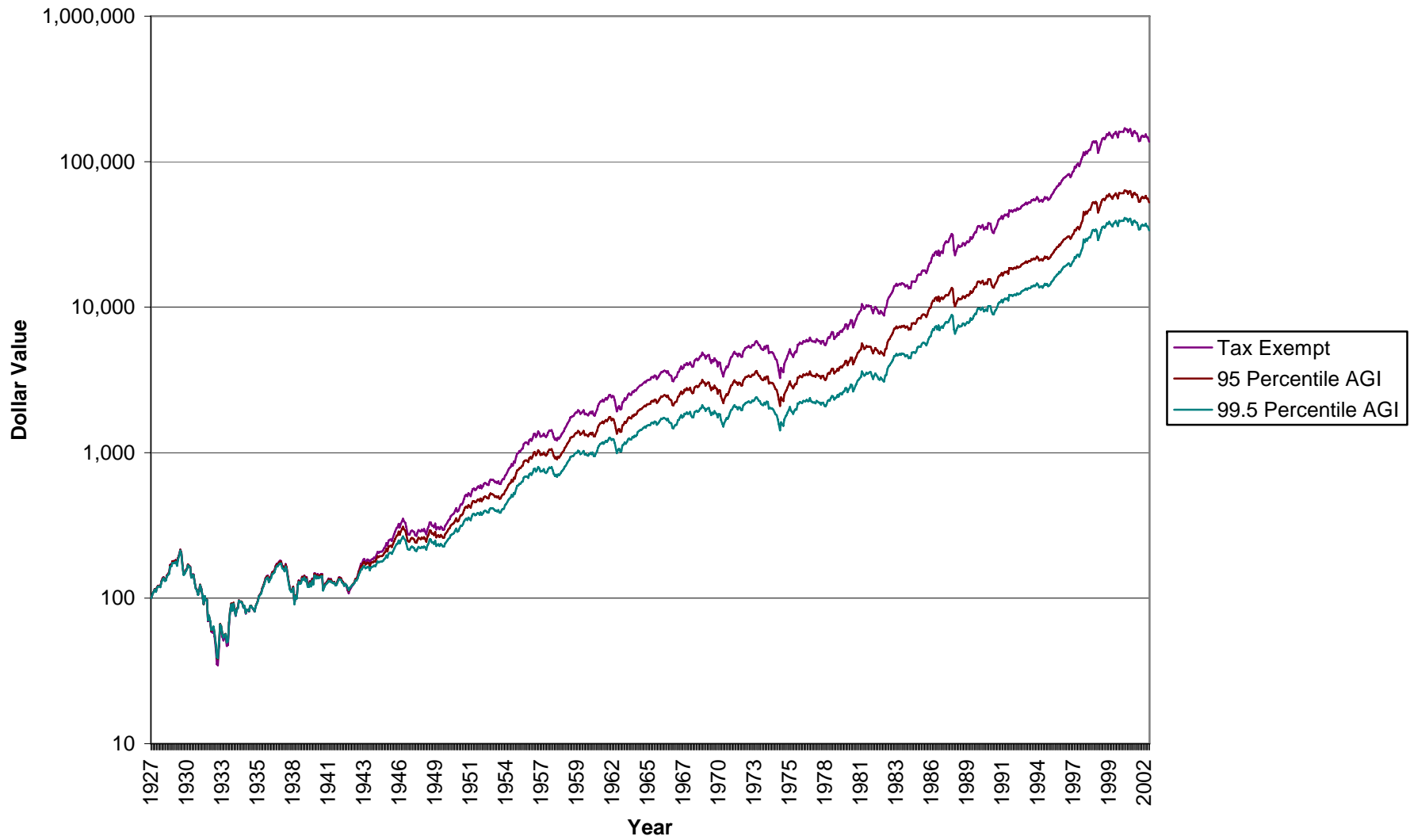


Figure 4.
Relative value of taxable self-financed portfolios to untaxed portfolios

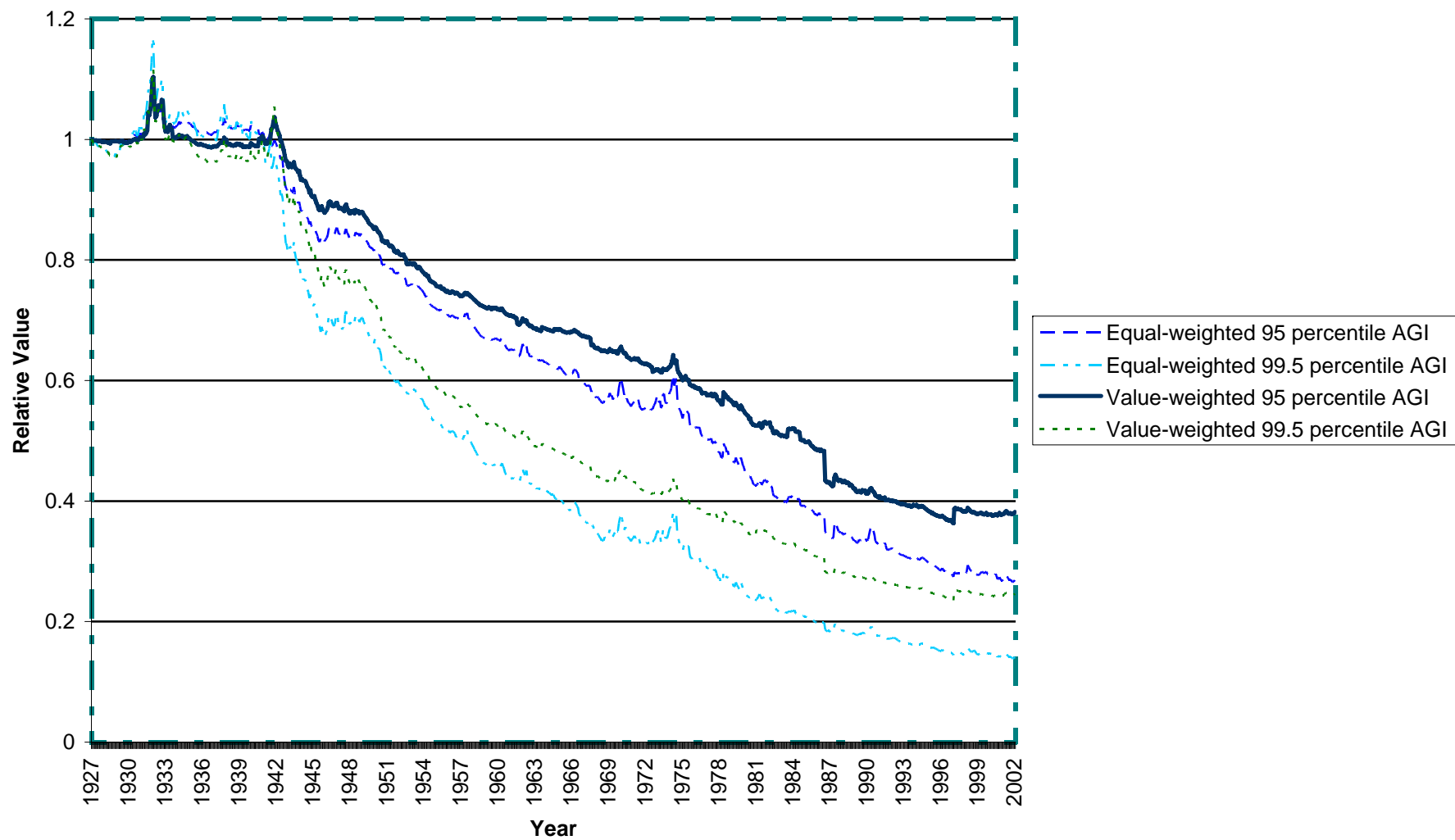


Table 2. Direct and indirect taxable ownership of equity by family AGI, 2001 SCF

Level of family AGI	Share of families above threshold	Share of direct taxable equity above threshold	Share of direct + indirect taxable equity above threshold	Share of dividends above threshold
0	88.1%	99.9%	99.6%	98.6%
25,000	59.7	97.3	96.3	93.3
50,000	31.9	90.3	87.4	82.4
75,000	17.3	80.9	77.4	70.5
100,000	9.7	74.5	69.8	61.8
125,000	6.7	69.5	63.9	55.9
150,000	4.9	65.8	59.1	51.6
175,000	3.7	62.6	55.3	45.6
200,000	3.0	60.0	52.5	42.2
225,000	2.6	55.7	48.8	38.1
250,000	2.2	52.7	45.6	36.6
275,000	2.0	51.4	44.5	35.8
300,000	1.7	44.6	38.8	34.9
325,000	1.6	42.6	36.8	33.7
350,000	1.4	40.4	35.0	32.8
375,000	1.3	40.0	34.5	31.6
400,000	1.1	38.2	33.0	30.6

Table 4. Tax Benefit of Optimal Capital Gains Realization--06/1927 to 06/2002

Strategy	Using the tax rates that correspond to the return period			Using tax rates that correspond to the 2000 tax code		
	95 th % Income	99 th % Income	99.5% Income	90 th % to 95% Income	99 th % Income	99.5% to 99.99% Income
VWRET	2.28	3.15	3.67	3.41	3.47	3.51
EWRET	8.44	12.71	15.18	19.33	22.13	24.31
No Dividend Portfolio	1.70	2.38	2.78	4.01	4.28	4.48
Low Dividend Portfolio	2.20	3.02	3.48	3.35	3.39	3.41
High Dividend Portfolio	1.04	1.51	1.79	1.65	1.76	1.84
Large	2.24	2.99	3.41	3.27	3.32	3.35
Growth	2.28	3.07	3.46	3.93	4.11	4.25
Small	1.61	2.43	2.89	3.43	3.84	4.15
Value	1.19	1.73	2.08	2.31	2.51	2.67
VWRET-RF	3.32	4.42	5.07	5.08	5.06	5.03
SMB	-7.94	-5.33	-4.99	27.34	37.16	45.83
HML	-0.15	1.86	2.78	11.74	15.52	18.49

Table 5. Tax impact of long strategies--06/1927 to 06/2002
Panel A: Uses tax rates from the tax code that correspond to the return period

Strategy	Statistic	Tax Exempt	95 th % Income	99 th % Income	99.5% Income
Value Weighted Market, dividend yield 4.01%					
	After Tax Return	9.63	8.36	8.00	7.78
	Avg Overhang	0.00	7.78	9.64	10.69
	CG Relative Tax Cost	0.00	2.13	1.74	1.47
	Div Relative Tax Cost	0.00	11.31	14.82	16.93
	Total Relative Tax Cost	0.00	13.19	16.97	19.28
Equal Weighted Market, dividend yield 3.67%					
	After Tax Return	11.98	10.24	9.71	9.38
	Avg Overhang	0.00	5.27	6.79	7.74
	CG Relative Tax Cost	0.00	6.41	7.73	8.54
	Div Relative Tax Cost	0.00	7.77	10.11	11.49
	Total Relative Tax Cost	0.00	14.56	18.94	21.73
Risk Free Bill					
	After Tax Return	3.75	2.54	2.22	2.07
	Avg Overhang	0.00	0.00	0.00	0.00
	CG Relative Tax Cost	0.00	0.00	0.00	0.00
	Div Relative Tax Cost	0.00	32.31	40.65	44.78
	Total Relative Tax Cost	0.00	32.31	40.65	44.78

Table 5. Tax impact of long strategies--06/1927 to 06/2002
Panel B: Uses the tax rates that correspond to the 2000 tax code

Strategy	Statistic	Tax Exempt	90 th to 95% Income	99 th % Income	99.5% to 99.99% Income
Value Weighted Market, dividend yield 4.01%					
	After Tax Return	9.63	8.14	7.93	7.78
	Avg Overhang	0.00	7.74	7.82	7.87
	CG Relative Tax Cost	0.00	1.67	1.59	1.54
	Div Relative Tax Cost	0.00	14.10	16.18	17.67
	Total Relative Tax Cost	0.00	15.48	17.64	19.20
Equal Weighted Market, dividend yield 3.67%					
	After Tax Return	11.98	10.20	9.96	9.79
	Avg Overhang	0.00	6.77	6.83	6.88
	CG Relative Tax Cost	0.00	4.73	5.11	5.40
	Div Relative Tax Cost	0.00	8.69	9.99	10.92
	Total Relative Tax Cost	0.00	14.85	16.88	18.35
Risk Free Bill					
	After Tax Return	3.75	2.59	2.40	2.27
	Avg Overhang	0.00	0.00	0.00	0.00
	CG Relative Tax Cost	0.00	0.00	0.00	0.00
	Div Relative Tax Cost	0.00	30.95	35.94	39.54
	Total Relative Tax Cost	0.00	30.95	35.94	39.54

Table 6. Tax Impact of Dividend Portfolio Strategies--06/1927-06/2002

Panel A: Uses the tax rates from the tax code that correspond to the return period

Strategy	Statistic	Tax Exempt	95 th % Income	99 th % Income	99.5% Income
No Dividend Portfolio, dividend yield 0.61%					
	After Tax Return	7.43	6.64	6.42	6.24
	Avg Overhang	0.00	3.57	4.26	4.72
	CG Relative Tax Cost	0.00	9.09	11.39	13.16
	Div Relative Tax Cost	0.00	0.87	1.13	1.31
	Total Relative Tax Cost	0.00	10.65	13.71	16.04
Low Dividend Portfolio, dividend yield 4.09%					
	After Tax Return	9.66	8.38	8.01	7.78
	Avg Overhang	0.00	8.00	10.02	11.17
	CG Relative Tax Cost	0.00	2.05	1.69	1.46
	Div Relative Tax Cost	0.00	11.47	14.99	17.09
	Total Relative Tax Cost	0.00	13.23	17.09	19.48
High Dividend Portfolio, dividend yield 5.45%					
	After Tax Return	11.84	9.76	9.14	8.75
	Avg Overhang	0.00	2.83	3.65	4.17
	CG Relative Tax Cost	0.00	6.02	7.28	8.03
	Div Relative Tax Cost	0.00	11.31	14.90	17.05
	Total Relative Tax Cost	0.00	17.59	22.85	26.08

Table 6. Tax Impact of Dividend Portfolio Strategies--06/1927-06/2002
Panel B: Uses the tax rates that correspond to 2000 tax code

Strategy	Statistic	Tax Exempt	90 th to 95% Income	99 th % Income	99.5% to 99.99% Income
No Dividend Portfolio, dividend yield 0.61%					
	After Tax Return	7.43	6.71	6.72	6.69
	Avg Overhang	0.00	3.47	3.47	3.46
	CG Relative Tax Cost	0.00	6.60	6.66	6.71
	Div Relative Tax Cost	0.00	0.39	0.60	0.73
	Total Relative Tax Cost	0.00	9.17	9.65	9.99
Low Dividend Portfolio, dividend yield 4.09%					
	After Tax Return	9.66	8.22	8.01	7.85
	Avg Overhang	0.00	8.79	8.89	8.96
	CG Relative Tax Cost	0.00	0.69	0.62	0.57
	Div Relative Tax Cost	0.00	14.27	16.37	17.88
	Total Relative Tax Cost	0.00	14.86	17.09	18.70
High Dividend Portfolio, dividend yield 5.45%					
	After Tax Return	11.84	9.50	9.22	9.01
	Avg Overhang	0.00	3.18	3.22	3.25
	CG Relative Tax Cost	0.00	5.10	5.14	5.17
	Div Relative Tax Cost	0.00	13.85	16.09	17.71
	Total Relative Tax Cost	0.00	19.75	22.16	23.90

Table 7. Tax impact of long style strategies--06/1927-06/2002

Panel A: Uses the tax rates from the tax code that correspond to the return period

Strategy	Statistic	Tax Exempt	95 th % Income	99 th % Income	99.5% Income
Large, dividend yield 4.03%					
	After Tax Return	9.34	8.12	7.76	7.55
	Avg Overhang	0.00	8.10	10.07	11.18
	CG Relative Tax Cost	0.00	1.61	1.05	0.71
	Div Relative Tax Cost	0.00	11.75	15.38	17.55
	Total Relative Tax Cost	0.00	13.14	16.91	19.25
Growth, dividend yield 3.52%					
	After Tax Return	8.93	7.57	7.26	7.05
	Avg Overhang	0.00	6.66	8.39	9.42
	CG Relative Tax Cost	0.00	4.35	4.23	4.25
	Div Relative Tax Cost	0.00	8.98	12.03	13.88
	Total Relative Tax Cost	0.00	13.66	17.21	19.59
Small, dividend yield 2.86%					
	After Tax Return	11.17	9.30	8.70	8.32
	Avg Overhang	0.00	0.09	0.31	0.49
	CG Relative Tax Cost	0.00	9.53	12.48	14.28
	Div Relative Tax Cost	0.00	7.22	9.37	10.70
	Total Relative Tax Cost	0.00	16.69	22.11	25.51
Value, dividend yield 4.46%					
	After Tax Return	11.78	10.15	9.49	9.08
	Avg Overhang	0.00	2.00	2.49	2.83
	CG Relative Tax Cost	0.00	8.79	11.00	12.27
	Div Relative Tax Cost	0.00	8.82	11.56	13.21
	Total Relative Tax Cost	0.00	18.47	23.84	27.10

Table 7. Tax impact of long style strategies--06/1927-06/2002

Panel B: Uses the tax rates that correspond to 2000 tax code

Strategy	Statistic	Tax Exempt	90 to 95% Income	99 th % Income	99.5% Income
Large, dividend yield 4.03%					
	After Tax Return	9.34	7.97	7.77	7.62
	Avg Overhang	0.00	8.69	8.78	8.84
	CG Relative Tax Cost	0.00	1.71	1.61	1.05
	Div Relative Tax Cost	0.00	11.01	11.75	15.38
	Total Relative Tax Cost	0.00	14.71	16.89	18.45
Growth, dividend yield 3.52%					
	After Tax Return	8.93	7.54	7.39	7.28
	Avg Overhang	0.00	7.94	8.00	8.05
	CG Relative Tax Cost	0.00	1.27	0.89	0.62
	Div Relative Tax Cost	0.00	12.07	13.93	15.27
	Total Relative Tax Cost	0.00	14.04	15.73	16.95
Small, dividend yield 2.86%					
	After Tax Return	11.17	9.07	8.80	8.60
	Avg Overhang	0.00	1.26	1.26	1.15
	CG Relative Tax Cost	0.00	10.81	11.97	12.80
	Div Relative Tax Cost	0.00	6.28	7.44	8.28
	Total Relative Tax Cost	0.00	18.79	21.24	23.01
Value, dividend yield 4.46%					
	After Tax Return	11.78	10.00	9.71	9.50
	Avg Overhang	0.00	2.21	2.23	2.24
	CG Relative Tax Cost	0.00	9.18	9.83	10.30
	Div Relative Tax Cost	0.00	8.76	10.18	11.19
	Total Relative Tax Cost	0.00	19.67	22.02	23.72

Table 8. Tax impact of long-short strategies**Panel A: Uses the tax rates from the tax code that corresponds to the return period**

Strategy	Statistic	Tax Exempt	95% Income	99% Income	99.5% Income
Market Risk Premium (VWRET-RF)					
	Total Return	5.89	5.83	5.78	5.71
	Long Return	9.63	8.36	8.00	7.78
	Short Return	3.75	2.54	2.22	2.07
	Avg Overhang	0.00	7.77	9.64	10.69
	CG Tax Cost	0.00	3.47	2.83	2.38
	Div Tax Cost	0.00	-2.07	-1.65	-0.82
	Relative Tax Cost	0.00	1.01	1.88	3.04
Small minus Big Market Cap (SMB)					
	Total Return	1.61	1.57	1.48	1.41
	Long Return	11.32	9.49	8.89	8.53
	Short Return	10.28	8.29	7.71	7.36
	Avg Overhang	0.00	1.42	2.22	2.71
	CG Tax Cost	0.00	12.90	21.32	26.60
	Div Tax Cost	0.00	8.08	9.26	10.78
	Relative Tax Cost	0.00	2.87	8.37	12.43
High minus Low B/M (HML)					
	Total Return	3.38	2.81	2.62	2.50
	Long Return	12.21	9.99	9.33	8.92
	Short Return	9.27	7.64	7.16	6.85
	Avg Overhang	0.00	0.66	1.09	1.35
	CG Tax Cost	0.00	6.66	10.21	12.66
	Div Tax Cost	0.00	10.90	13.71	15.21
	Relative Tax Cost	0.00	16.79	22.54	26.20

Table 8. Tax impact of long-short strategies--06/1927-06/2002
Panel B: Uses the tax rates that correspond to 2000 tax code

Strategy	Statistic	Tax Exempt	90 th to 95% Income	99 th % Income	99.5% to 99.99% Income
Market Risk Premium (VWRET-RF)					
	Total Return	5.89	5.56	5.54	5.52
	Long Return	9.63	8.14	7.93	7.78
	Short Return	3.75	2.59	2.40	2.27
	Avg Overhang	0.00	7.75	7.82	7.88
	CG Tax Cost	0.00	2.71	2.57	2.49
	Div Tax Cost	0.00	3.35	3.57	3.72
	Relative Tax Cost	0.00	5.61	5.97	6.24
Small minus Big Market Cap (SMB)					
	Total Return	1.61	1.41	1.36	1.32
	Long Return	11.32	9.27	9.00	8.80
	Short Return	10.28	8.00	7.77	7.59
	Avg Overhang	0.00	2.85	2.91	2.95
	CG Tax Cost	0.00	23.45	28.21	31.64
	Div Tax Cost	0.00	22.39	20.74	19.53
	Relative Tax Cost	0.00	12.91	15.94	18.13
High minus Low B/M (HML)					
	Total Return	3.38	2.78	2.74	2.72
	Long Return	12.21	9.92	9.65	9.44
	Short Return	9.27	7.31	7.07	6.90
	Avg Overhang	0.00	1.29	1.32	1.34
	CG Tax Cost	0.00	11.95	11.91	11.88
	Div Tax Cost	0.00	12.00	12.66	13.15
	Relative Tax Cost	0.00	17.91	18.85	19.53

Conclusions

Taxation has a drastic impact on portfolio performance

Taxes are triggered by
Dividend payments

Capital gains realization

Both are important, both have heterogeneous impact

Value stocks tend to have higher tax burdens than growth

Small cap stocks tend to have higher tax burdens than large cap

Tax burden of the recent style factors is much greater than the market risk premium