Putting the ‘Finance’ into ‘Public Finance’: A Theory of Capital Gains Taxation

Mark Aguiar

Benjamin Moll

Florian Scheuer

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Tax treatment of capital gains due to changing asset prices

Tax system of typical country: tax capital gains on realization (i.e. sale)

But recent policy proposals:

- tax capital gains on accrual
  (Biden administration,...)
- tax wealth (Piketty, Zucman, ...)

Old idea: Haig-Simons comprehensive income tax

$$\text{income} = \text{consumption} + \Delta\text{wealth}$$

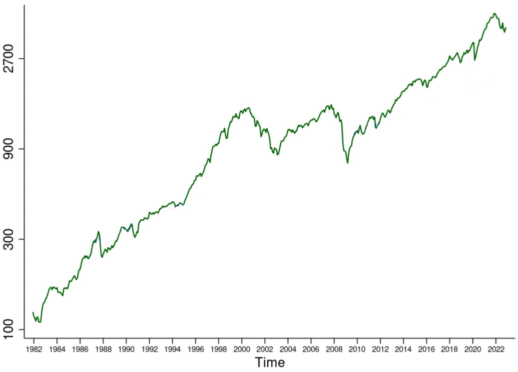
SEPTEMBER 23, 2021

What Is the Average Federal Individual Income Tax Rate on the Wealthiest Americans?

By Greg Leiserson, Senior Economist (CEA); and Danny Yagan, Chief Economist (OMB)

Abstract: We estimate the average Federal individual income tax rate paid by America's 400 wealthiest families, using a relatively comprehensive measure of their income that includes income from unsold stock. We do so using publicly available statistics from the IRS Statistics of Income Division, the Survey of Consumer Finances, and Forbes magazine. In our primary analysis, we estimate an average Federal individual income tax rate of 8.2 percent for the period 2010-2018. We also present sensitivity analyses that yield estimates in the 6-12 percent range. The President's proposals mitigate two key

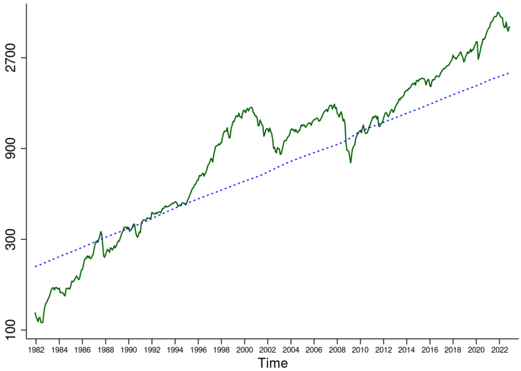
Background: rising and fluctuating asset prices



- Green line: S&P 500

Background: rising and fluctuating asset prices

- Conventional view: asset prices move too much to be accounted for by changing cash flows alone ⇒ discount rate variation (Shiller, Campbell-Shiller, ...)



- Green line: S&P 500
- Blue line: only cash flow variation (source: Bordalo et al. following Shiller 1981)

Large and growing positive literature

Kuhn et al. (2020), Greenwald et al. (2021), Fagereng et al. (2021, 2023), Martínez-Toledano (2023)...

But what does this mean for tax policy?

Kuhn et al. (2020), Greenwald et al. (2021), Fagereng et al. (2021, 2023), Martínez-Toledano (2023)...

When asset prices rise, how should optimal tax system adjust?

No guidance from standard optimal capital tax theory:

No asset prices!

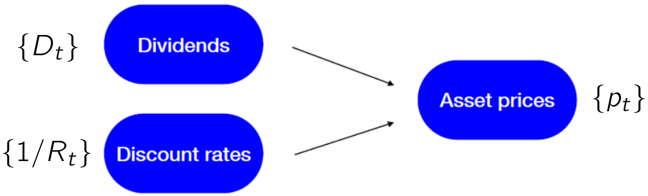
No 'finance' in 'public finance'

What we do: optimal redistributive taxation with changing asset prices

Asset returns

$$R_{t+1} = \frac{D_{t+1} + p_{t+1}}{p_t} = \text{dividend yield} + \text{capital gain}$$

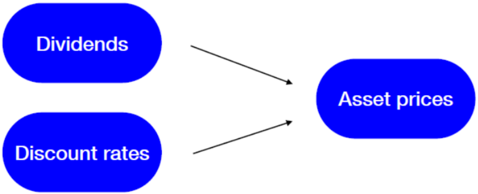
Asset pricing



Experiment:

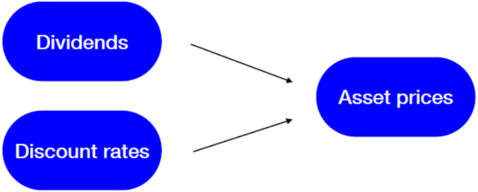
- asset prices change, starting from some baseline (steady state or BGP)
- how should optimal tax system adjust?

What we find



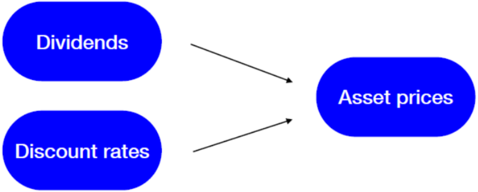
What we find

$$\Delta T = \tau \times \text{wealth} \times \Delta p$$



What we find

$$\Delta T = \underbrace{\tau \times \text{wealth} \times \Delta p}_{\text{Haig-Simons}}$$



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$$\Delta T = \underbrace{\tau \times \text{wealth} \times \Delta p}_{\text{Haig-Simons}}$$

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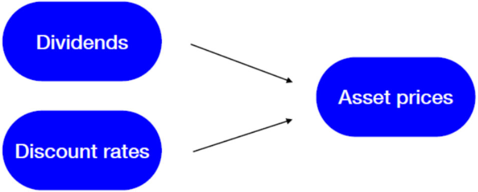

What we find

$$\Delta T = \underbrace{\tau \times \text{wealth} \times \Delta p}_{\text{Haig-Simons}}$$

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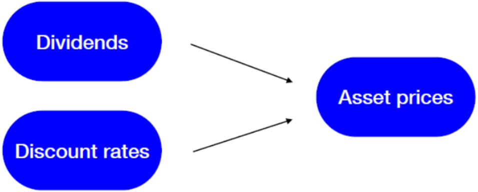

Intuition: higher asset prices benefit sellers not holders

What we find

$$\Delta T = \underbrace{\tau \times \text{wealth} \times \Delta p}_{\text{Haig-Simons}}$$

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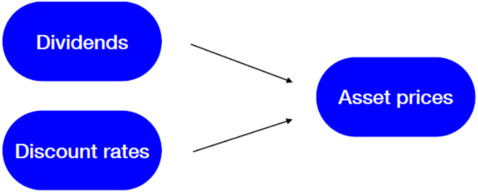

Intuition: higher asset prices benefit sellers not holders

Beyond simplest case: ~~accrual-based taxes~~ even with dividend-driven Δp

In general, combination of realization-based capital gains & dividend tax

Plan

1. Baseline model (no risk, partial equilibrium)
2. Two time periods
3. First-best
4. Second-best (Mirrlees)
5. Back to multi-period model
6. Extensions
    - General equilibrium
    - Heterogeneous returns
    - Risk and borrowing
    - Borrowing versus selling
    - Bequests and sub-optimality of step-up in basis at death

Baseline model

Investors

Indexed by $\theta \sim F(\theta)$, differ in initial wealth $k_0(\theta)$, income profiles $\{y_t(\theta)\}_{t=0}^T$

$$V = \max_{\{c_t, k_{t+1}\}_{t=0}^T} U(c_0, \ldots, c_T) \quad \text{s.t.} \quad c_t + p_t(k_{t+1} - k_t) = y_t + D_t k_t - T_t$$

Investors

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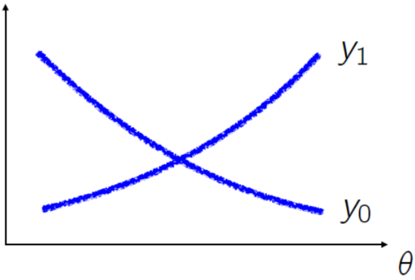

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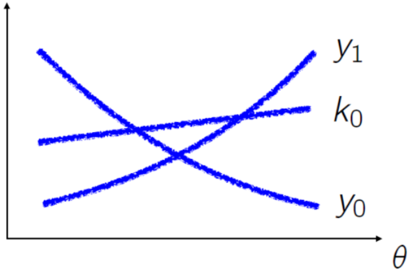
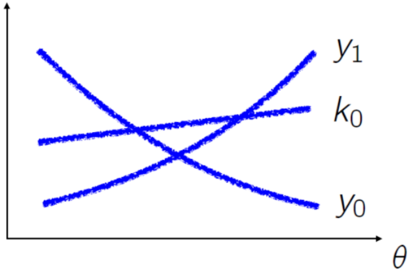


Investors

Indexed by $\theta \sim F(\theta)$, differ in initial wealth $k_0(\theta)$, income profiles $\{y_t(\theta)\}_{t=0}^T$

$$V = \max_{\{c_t, k_{t+1}\}_{t=0}^T} U(c_0, ..., c_T) \quad \text{s.t.} \quad c_t + p_t(k_{t+1} - k_t) = y_t + D_t k_t - T_t$$



Asset return $R_{t+1} = \frac{D_{t+1}+p_{t+1}}{p_t}$

Small open economy: $\{p_t, D_t\}$ exogenously given

Comments

Endogenous payout policy and share repurchases

- D_t = profits net of investment, p_t = total value of firm

Owner-occupied housing

- D_t = imputed rents

Haig-Simons income includes unrealized capital gains

- recall

$$c_t + p_t(k_{t+1} - k_t) = y_t + D_t k_t$$

- add unrealized capital gains $(p_t - p_{t-1})k_t$ on both sides

$$c_t + \underbrace{p_t k_{t+1} - p_{t-1} k_t}_{\text{change in wealth}} = \underbrace{y_t + D_t k_{t-1} + (p_t - p_{t-1})k_t}_{\text{Haig-Simons income}}$$

Comparison to setups in capital taxation literature

1. Partial equilibrium models with constant $R_t = \overline{R}$ (Atkinson-Stiglitz,...)
2. Neoclassical growth model (Chamley, ...): depends on decentralization
   - in all decentralizations: $R_{t+1} = \frac{1}{\beta}\frac{U'(C_t)}{U'(C_{t+1})}$, unit price of capital = 1
   - example 1: asset = capital $\Rightarrow p_t = 1 \Rightarrow$ no capital gains
   - example 2: shares in rep firm. BGP with $A_{t+1}/A_t = G$:

$$\overline{R} = (1/\beta)G^{1/\sigma} \quad \text{with} \quad \frac{D_{t+1}}{p_t} = \overline{R} - G \quad \text{and} \quad \frac{p_{t+1}}{p_t} = G$$

3. Growth models with het. households (Werning, Judd, Straub-Werning,...)
   - same as 2
4. Our setup
   - optimal taxation with exogenous $\{p_t, D_t\}$ and hence returns $\{R_t\}$
   - allows us to take on board discount rate variation in flexible way

Two time periods

- Investors indexed by $\theta \sim F(\theta)$

$$
\begin{aligned}
V = \max_{c_0, c_1, k_1} & \; U(c_0, c_1) \quad \text{s.t.} \\
c_0 + p(k_1 - k_0) &= y_0 - T_0 \\
c_1 &= y_1 + D k_1
\end{aligned}
$$

- Resource constraints

$$
\int c_0(\theta) dF(\theta) + \frac{p}{D} \int c_1(\theta) dF(\theta) \leq Y
$$

$$
Y \equiv \int y_0(\theta) dF(\theta) + \frac{p}{D} \int y_1(\theta) dF(\theta) + p \int k_0(\theta) dF(\theta)
$$

Two time periods

- In terms of asset sales $x \equiv k_0 - k_1$

$$V = \max_{c_0, c_1, x} U(c_0, c_1) \quad \text{s.t.}$$
$$c_0 = y_0 + px - T_0$$
$$c_1 = y_1 + D(k_0 - x)$$

- Resource constraints

$$\int c_0(\theta) dF(\theta) + \frac{p}{D} \int c_1(\theta) dF(\theta) \leq Y$$
$$Y \equiv \int y_0(\theta) dF(\theta) + \frac{p}{D} \int y_1(\theta) dF(\theta) + p \int k_0(\theta) dF(\theta)$$

First best

Pareto problem

Individual lump-sum taxes $T_0(\theta)$

$$\max_{c_0(\theta),c_1(\theta)} \int \omega(\theta) U(c_0(\theta), c_1(\theta)) dF(\theta) \quad \text{s.t.}$$

$$\int c_0(\theta) dF(\theta) + \frac{p}{D} \int c_1(\theta) dF(\theta) \leq Y$$

Experiment: original $\overline{p}, \overline{D}$ and tax system $\overline{T}_0(\theta)$. Then p and D change.

$$U(c_0, c_1) = G\left(C(c_0, c_1)\right), \quad C(c_0, c_1) = \left(c_0^{\frac{\sigma-1}{\sigma}} + \beta c_1^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{\sigma-1}}, \quad G(C) = \frac{C^{1-\gamma}}{1-\gamma}$$

Changing asset prices

Proposition: Suppose the asset price increases by Δp while dividends D remain unchanged. The change in the optimal tax $T_0(\theta)$ is

aggregate asset sales

$$\Delta T_0(\theta) = x(\theta)\Delta p - \Omega(\theta) X \Delta p$$

100% tax on realized capital gains

$$\frac{\omega(\theta)^{1/\gamma}}{\int \omega(\theta')^{1/\gamma} dF(\theta')}$$

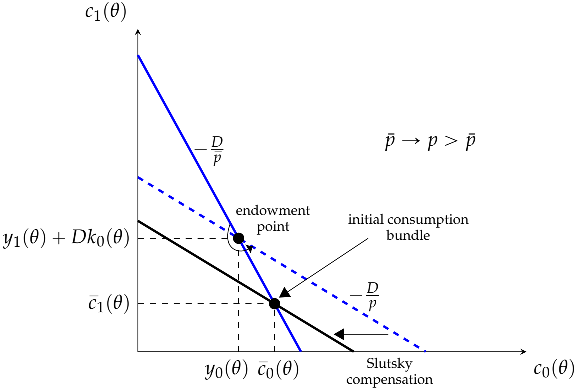
Special case: $\beta D/p = 1$ and $Y_0 = Y_1 + DK_0$. Then $X = 0$.

- Holds even for large Δp
- Sales x at new price
- Tax on net transactions
- Subsidy if $x < 0$

Trading gains and losses

Slutsky Compensation

- Change in the investor's total budget that keeps the initial consumption bundle affordable at the new prices



Changing asset prices and dividends

Proposition: Suppose the asset price increases by Δp and dividends by ΔD. The change in the optimal tax $T_0(\theta)$ is

$$\Delta T_0(\theta) = x(\theta)\Delta p + \frac{p}{D}k_1(\theta)\Delta D - \Omega(\theta)\left[X\Delta p + \frac{p}{D}K_1\Delta D\right]$$

tax on realized capital gains

tax on dividend income

Changing asset prices and dividends

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tax on realized capital gains

tax on dividend income

Alternatively, set $\Delta T_0 = x\Delta p - \Omega(\theta)X\Delta p$ and $\Delta T_1 = k_1 \Delta D - \Omega(\theta)K_1\Delta D$

Changing asset prices and dividends

Proposition: Suppose the asset price increases by Δp and dividends by ΔD. The change in the optimal tax $T_0(\theta)$ is

$$\Delta T_0(\theta) = \underbrace{x(\theta)\Delta p}_{\text{tax on realized capital gains}} + \underbrace{\frac{p}{D}k_1(\theta)\Delta D}_{\text{tax on dividend income}} - \Omega(\theta)\left[X\Delta p + \frac{p}{D}K_1\Delta D\right]$$

Alternatively, set $\Delta T_0 = x\Delta p - \Omega(\theta)X\Delta p$ and $\Delta T_1 = k_1\Delta D - \Omega(\theta)K_1\Delta D$

Special case $\Delta D/\Delta p = D/p$? Asset price change driven **only** by dividends.

Changing asset prices and dividends

Proposition: Suppose the asset price increases by Δp and dividends by ΔD. The change in the optimal tax $T_0(\theta)$ is

$$\Delta T_0(\theta) = x(\theta)\Delta p + \frac{p}{D}k_1(\theta)\Delta D - \Omega(\theta)\left[X\Delta p + \frac{p}{D}K_1\Delta D\right]$$

$$= \frac{p}{D}(k_0(\theta) - x(\theta))\frac{D}{p}\Delta p$$

Alternatively, set $\Delta T_0 = x\Delta p - \Omega(\theta)X\Delta p$ and $\Delta T_1 = k_1\Delta D - \Omega(\theta)K_1\Delta D$

Special case $\Delta D/\Delta p = D/p$? Asset price change driven **only** by dividends.

Special case: fixed discount rates

Proposition: Suppose the asset price increases by Δp while the discount rate D/p remains unchanged. The change in the optimal tax $T_0(\theta)$ is

aggregate wealth

$$\Delta T_0(\theta) = k_0(\theta)\Delta p - \Omega(\theta) K_0 \Delta p$$

100% tax on wealth increase

Special case: fixed discount rates

Proposition: Suppose the asset price increases by Δp while the discount rate D/p remains unchanged. The change in the optimal tax $T_0(\theta)$ is

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100% tax on wealth increase

Haig-Simons

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aggregate wealth

$$\Delta T_0(\theta) = k_0(\theta)\Delta p - \Omega(\theta)K_0\Delta p$$

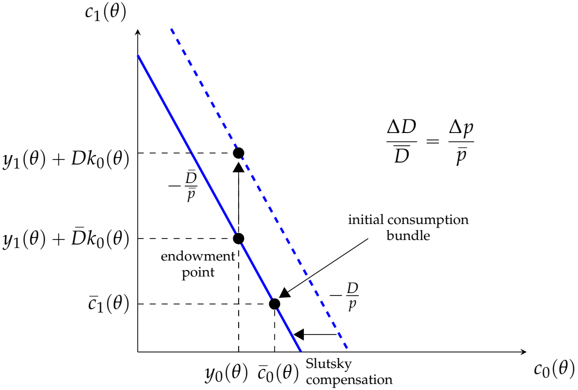
100% tax on wealth increase

Haig-Simons

- Tax on wealth/unrealized gains is knife-edge!
- Later: multi-period or heterogeneous returns
  $\Rightarrow$ don't work in general even with dividend-driven p-changes
- In general, tax must depend on realizations
- ▸ Consumption tax ▸ Tax on total returns

Slutsky Compensation

- Change in the investor's total budget that keeps the initial consumption bundle affordable at the new prices



Second best

Distortive nonlinear taxes

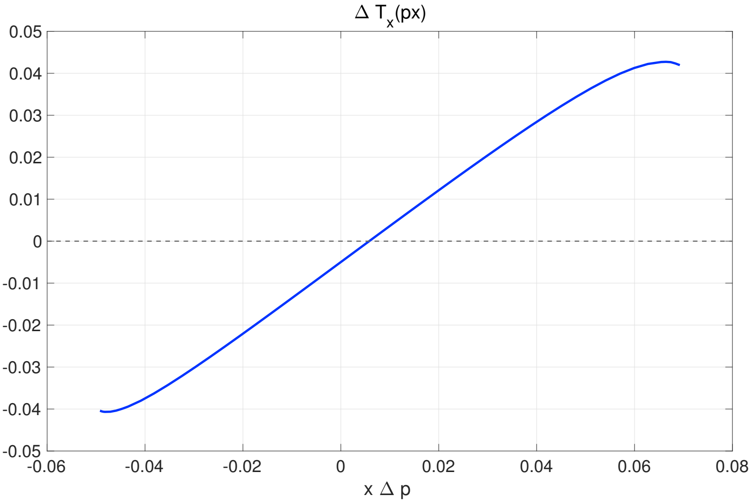
1. Capital sales tax $T_x(px)$

2. Wealth tax $T_k(pk_1)$

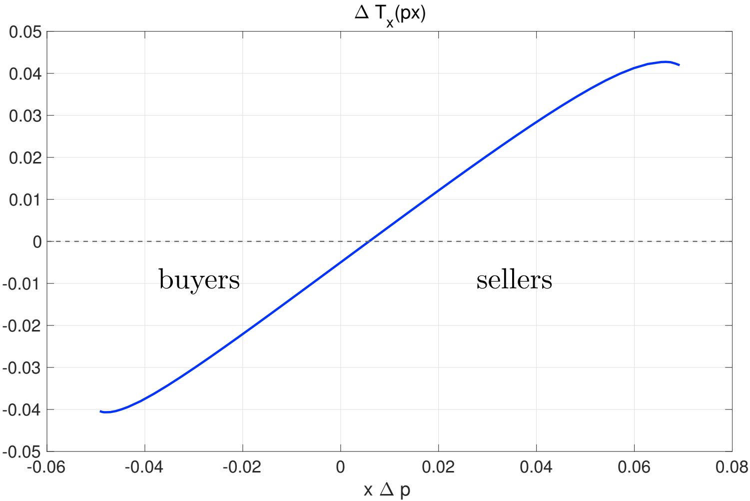
$$
\begin{aligned}
c_0 &= y_0 + px - T_x(px) \\
c_1 &= Dk_1 + y_1 - T_k(pk_1) \\
k_1 &= k_0 - x
\end{aligned}
$$

Other instruments similar, e.g. dividend/capital income tax $T_D(Dk_1)$

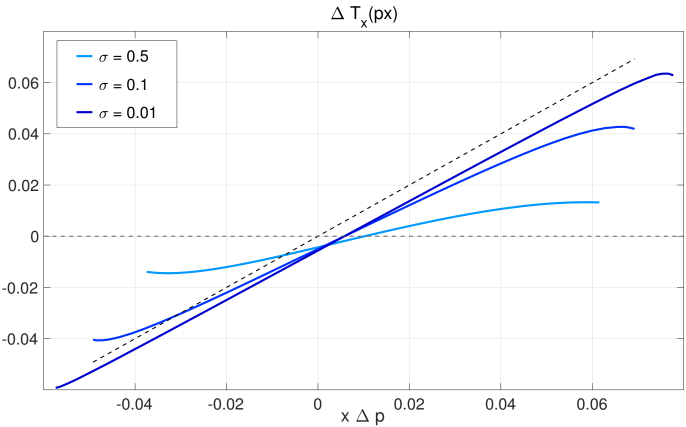
How the optimal tax responds to a rising asset price



How the optimal tax responds to a rising asset price



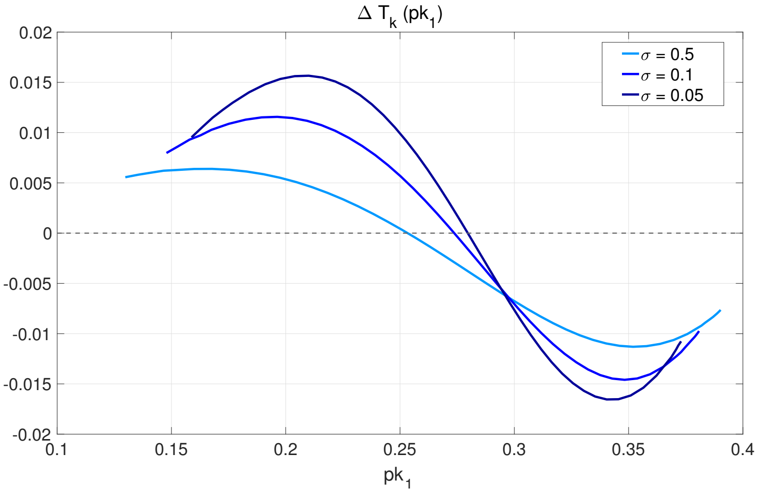
Role of the IES



Proposition: Suppose $V'_{FB}(\theta) \in [y'_0(\theta), D'_k(\theta) + y'_1(\theta)]\ \forall\theta$. Then the solution to the second-best problem converges to the first-best allocation as $\sigma \to 0$.

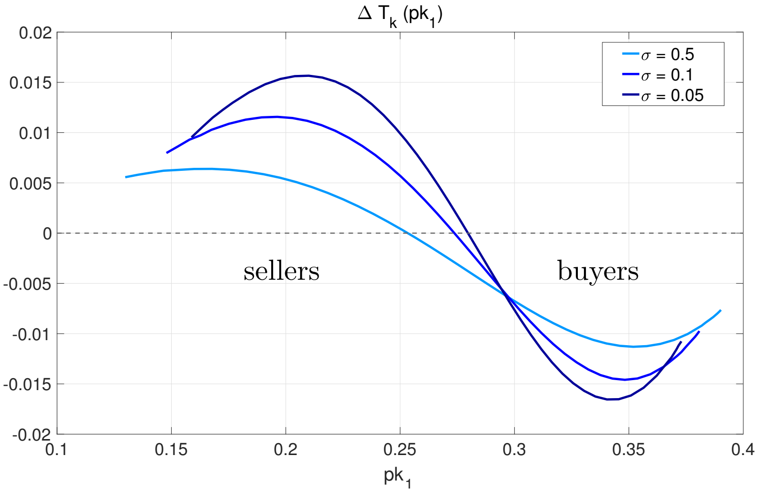
Wealth tax

▸ Taxes in levels



Wealth tax

▸ Taxes in levels



Back to multi-period model

Investors

$$\max_{\{c_t, k_{t+1}\}} \frac{1}{1-\gamma} \left(\sum_{t=0}^{T} \beta^t c_t^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma(1-\gamma)}{\sigma-1}} \qquad \text{s.t.}$$

$$p_t k_{t+1} + c_t = y_t + D_t k_t + p_t k_t - T_t$$

Rates of return:

$$R_{t+1} = \frac{D_{t+1} + p_{t+1}}{p_t}, \qquad R_{0\to t} = R_1 \cdot R_2 \cdots R_t$$

Special case: constant discount rates

$$\frac{\Delta D_{t+1} + \Delta p_{t+1}}{\Delta p_t} = \frac{D_{t+1} + p_{t+1}}{p_t} \quad \text{i.e.,} \quad R_{t+1} \text{ unchanged, only } R_0 \text{ affected}$$

$$\Rightarrow \qquad \sum_{t=0}^{T} R_{0\to t}^{-1} \Delta T_t(\theta) = [k_0(\theta) - \Omega(\theta) K_0](\Delta D_0 + \Delta p_0)$$

Tax unrealized gain at $t = 0$ but tax on all future gains $= 0 \Rightarrow$ ~~Haig-Simons~~

- perfect foresight so Δp_0 already incorporates all news about $\{\Delta D_t\}_{t=1}^{T}$

Even more special case:

- constant discount rates
- at each $t \geq 0$, MIT shock to $\{D_{t+s}\}$ so that realized $R_t = \frac{D_t + p_t}{p_{t-1}}$ moves

$$\sum_{s \geq t} R_{t\to t+s}^{-1} \Delta T_s(\theta) = [k_t(\theta) - \Omega(\theta) K_t] (\Delta p_t + \Delta D_t)$$

100 % tax on unrealized capital gains at each $t \geq 0$ = Haig-Simons

Extensions

- General equilibrium
- Heterogeneous returns
- Risk and borrowing
- Borrowing versus selling
- Bequests and sub-optimality of step-up in basis at death

Conclusion

When asset valuations change, optimal taxes change by

$$\Delta T = \tau \times \text{sales} \times \Delta p$$

In general, combo of realization-based capital gains + dividend taxes works

Wealth or accrual-based taxes are at best knife-edge

- don't work in general even with cashflow-driven asset price changes
- often redistribute in "wrong" direction

Linked backup slides

Consumption tax ▸ back

Proposition: Suppose the asset price increases by Δp and dividends by ΔD. The change in the optimal taxes $T_0(\theta)$ and $T_1(\theta)$ is

$$\Delta T_t(\theta) = \Delta \hat{c}_t(\theta) - \Omega(\theta)\Delta C_t$$

where $\Delta \hat{c}_t$ is the change in consumption holding taxes fixed.

No need to know source of capital gains: Δp vs. ΔD!

Kaldor's expenditure tax!

Tax on total returns ▸ back

$$c_0 + a_1 = y_0 + R_0 a_1 - T_0, \qquad c_1 = y_1 + R_1 a_1$$

where $R_0 = p/p_{-1}$, $R_1 = D/p$ which are $R_{t+1} = \frac{D_{t+1}+p_{t+1}}{p_t}$ with $D_0 = p_1 = 0$

- note: $p \uparrow$ holding D fixed $\Rightarrow R_0 \uparrow$ but $R_1 \downarrow$

Proposition: Suppose the asset price increases by Δp and dividends by ΔD resulting in return changes ΔR_0 and ΔR_1. Then

$$\Delta T_0(\theta) = a_0(\theta)\Delta R_0 + \frac{1}{R_1} a_1(\theta)\Delta R_1 - \Omega(\theta)\left[A_0(\theta)\Delta R_0 + \frac{1}{R_1} A_1(\theta)\Delta R_1\right]$$

Alternatively, set $\Delta T_0 = a\Delta R_0 - \Omega(\theta) A_0 \Delta R_0$ and $\Delta T_1 = a_1 \Delta R_1 - \Omega(\theta) A_1 \Delta R_1$

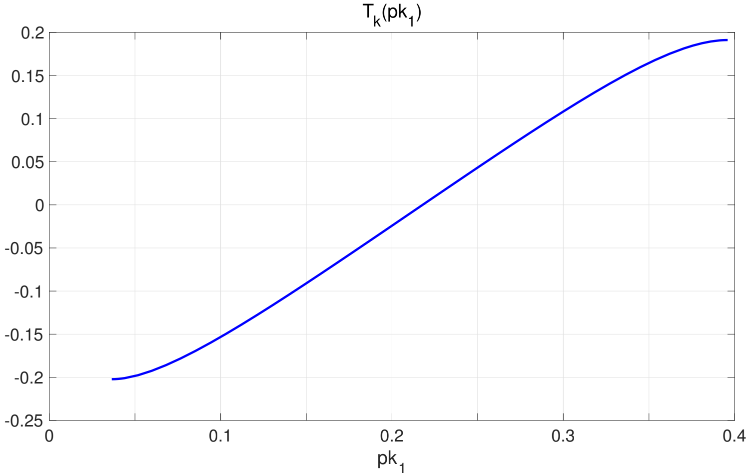
Special case: constant discount rate $\Delta R_1 = 0 \Rightarrow$ Haig-Simons

But ~~Haig-Simons~~ in all other cases $\Delta R_1 \neq 0$

Tax payments potentially volatile: "Bob" $\Rightarrow$ large tax, followed by large rebate

Optimal wealth tax schedule

back



Extensions

General Equilibrium

Equilibrium asset price

- Suppose capital is in fixed supply $K_0 = K_1 = K$
- Asset price p^* adjusts to clear market:

$$p^* = \beta D \left(\frac{Y_0}{Y_1 + DK} \right)^{\frac{1}{\sigma}}$$

Proposition: Suppose the asset price increases by Δp^* while dividends D remain unchanged. The change in the optimal tax $T_0(\theta)$ is

$$\Delta T_0(\theta) = x(\theta) \Delta p^*$$

Heterogeneous Cashflows

Trading with adjustment costs

$$c_0 + qb = p(k_0 - k_1) - \chi(k_0 - k_1) + y_0 - T_0$$

$$c_1 = D(\theta)k_1 + b + y_1$$

- heterogeneous dividends $D(\theta), \theta \sim F(\theta)$
- convex adjustment cost

Proposition: Suppose the asset price increases by Δp while dividends $D(\theta)$ remain unchanged. The change in the optimal tax $T_0(\theta)$ is

$$\Delta T_0(\theta) \approx x(\theta)\Delta p - \Omega(\theta)x\Delta p - \frac{1}{2}\chi''(x(\theta))\Delta x(\theta)^2$$

Heterogeneous returns in GE

Suppose $\chi(x) = \kappa x^2$ and capital is in fixed supply

Then

$$p^* = q \int D(\theta) dF(\theta)$$

Asset price changes for everyone when some dividends change...

... even for investors whose dividends did not change!

$\Rightarrow$ ~~Haig-Simons~~

Risk and borrowing

Two assets

Aggregate return risk $D(s), s \in S$, probabilities $\pi(s)$

$$c_0 = p(k_0 - k_1) + qb + y_0 - T_0$$
$$c_1(s) = D(s)k_1 - b + y_1 - T_1(s)$$

Asset prices:

1. capital $p = \mathbb{E}[M(s)D(s)]$
2. bond $q = \mathbb{E}[M(s)]$

where $M(s) =$ SDF of rep counterparty in global financial markets

First-best problem

Individual lump-sum taxes $T_0(\theta), T_1(\theta, s)$ with $\int T_1(\theta, s) dF(\theta) = 0$, all s

$$\max_{c_0(\theta), c_1(\theta,s), \mu(\theta)} \int \omega(\theta) U(c_0(\theta), \mu(\theta)) dF(\theta) \quad \text{s.t.}$$

$$\int c_0(\theta) dF(\theta) + q \int c_1(\theta, s) dF(\theta) = Y(s) \quad \forall s$$

$$U(c_0, \mu) = \frac{C(c_0, \mu)^{1-\gamma}}{1-\gamma}, \; C(c_0, \mu) = \left(c_0^{\frac{\sigma-1}{\sigma}} + \beta \mu^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}, \; \mu = \left(\sum_s c_1(s)^{1-\alpha} \pi(s) \right)^{\frac{1}{1-\alpha}}$$

Special case: changing discount rates (SDF)

Proposition: Suppose the SDF $M(s)$ changes such that asset prices change by $(\Delta p, \Delta q)$. Holding fixed $\mathbb{E}[T_1(\theta, s)M(s)/q])$, the change in the optimal tax $T_0(\theta)$ is

$$\Delta T_0(\theta) = x(\theta)\Delta p + b(\theta)\Delta q - \Omega(\theta)[X\Delta p + B\Delta q]$$

- Borrowers/savers are winners/losers from change in q
- No borrowing constraint (would not matter with first-best tax instruments)