Putting the ‘Finance’ into ‘Public Finance’

A Theory of Capital Gains Taxation

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Princeton

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Zurich

Capital gains taxes in practice

- Capital gains typically taxed upon realization

Capital gains taxes in practice

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- But recent policy proposals
    - tax capital gains on accrual
      (Biden administration…)
    - tax wealth
      (Piketty, Zucman…)
- Old idea: Haig-Simons comprehensive income tax:

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

Classics

Auerbach (1989): "Many of the distortions associated with the present system of capital gains taxation result from its deviation from the Haig-Simons approach. These deviations may have historical explanations but their persistence is hard to rationalize from an economic perspective."

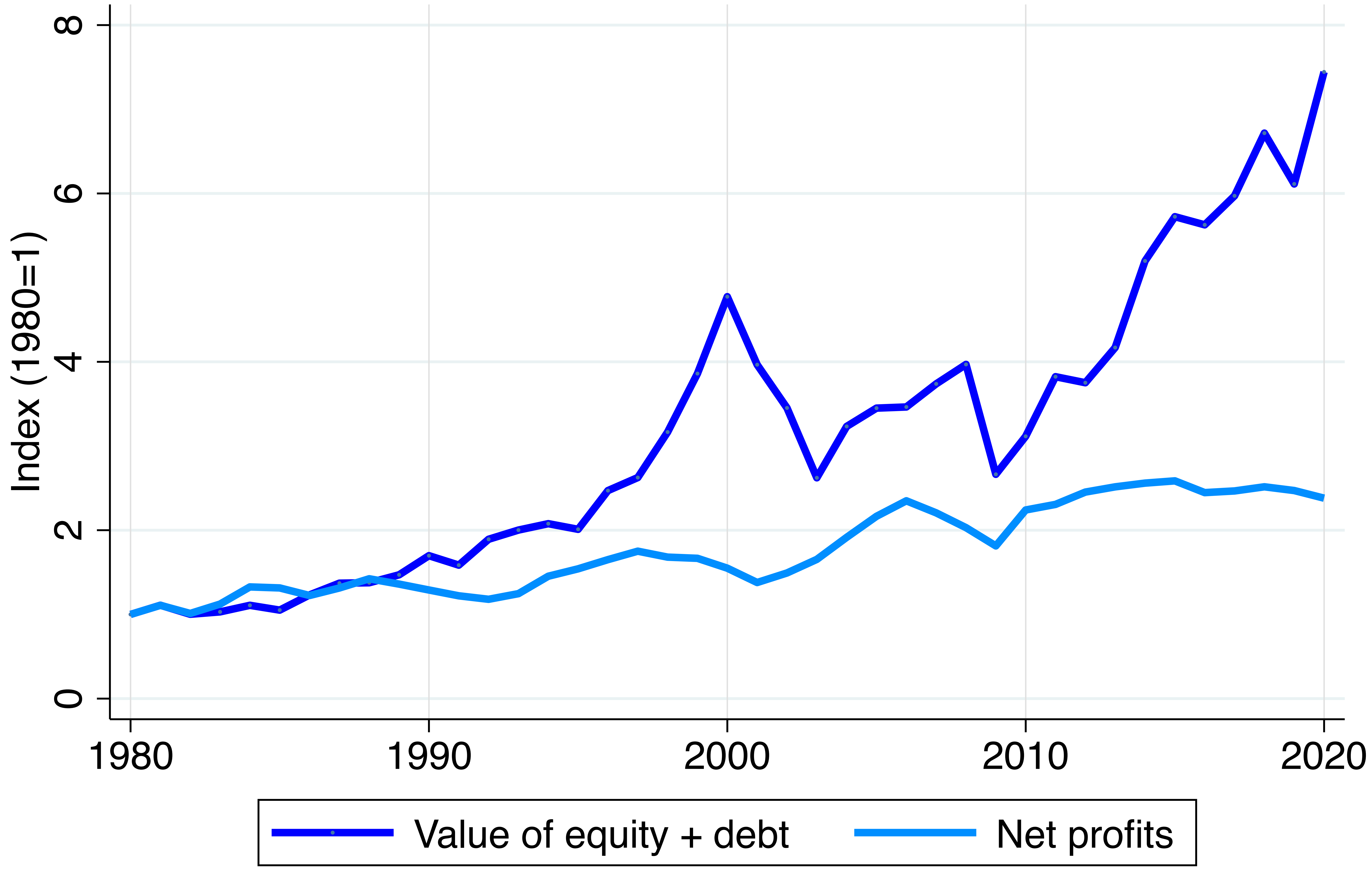
SEPTEMBER 23, 2021

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)

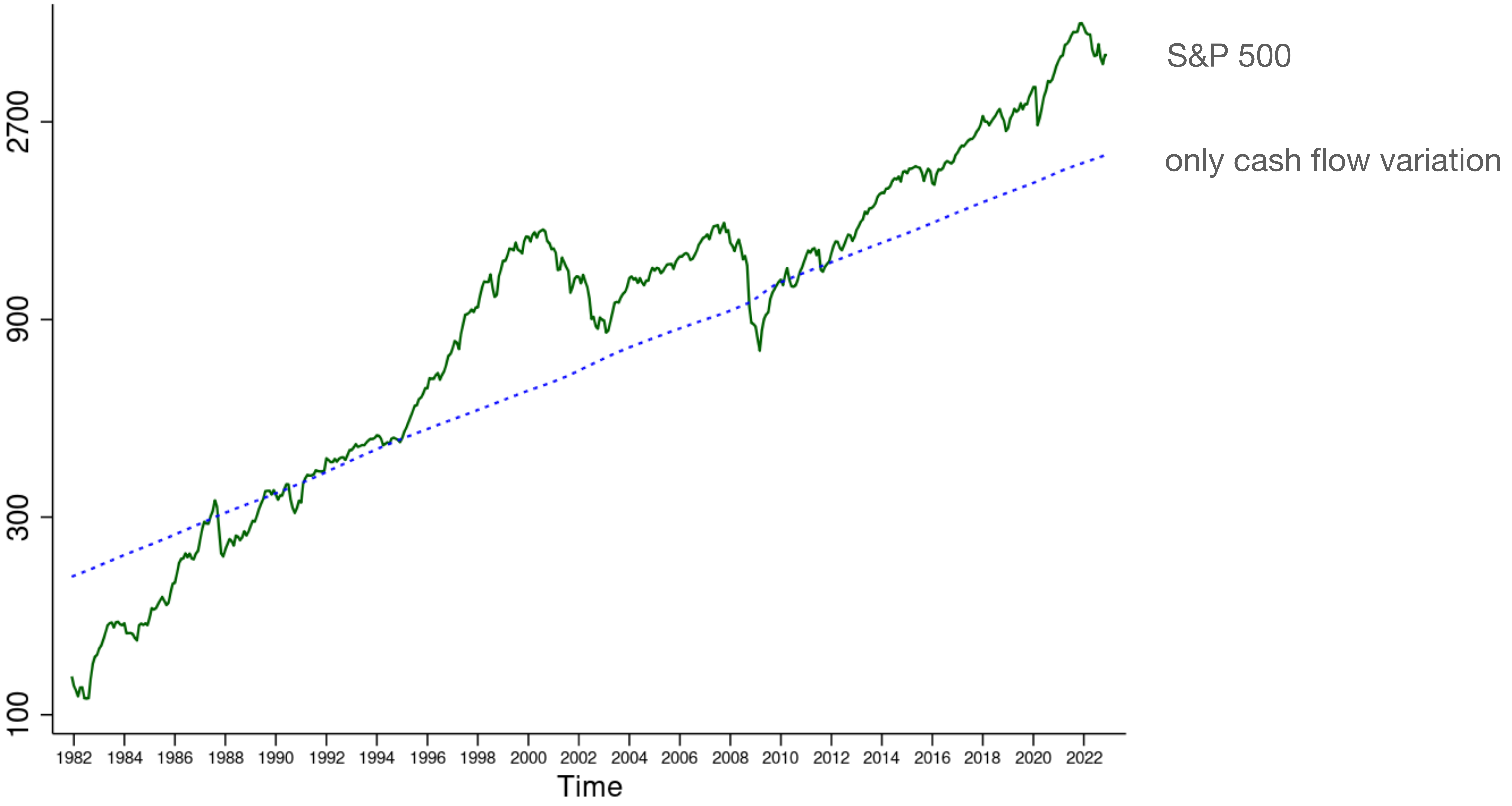
Abstract: We estimate the average Federal individual income tax rate paid by America's 400 wealthiest families, using a relatively comprehensive measure of their income that includes income from unsold stock. We do so using publicly available statistics from the IRS Statistics of Income Division, the 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

Capital gains from rising asset prices



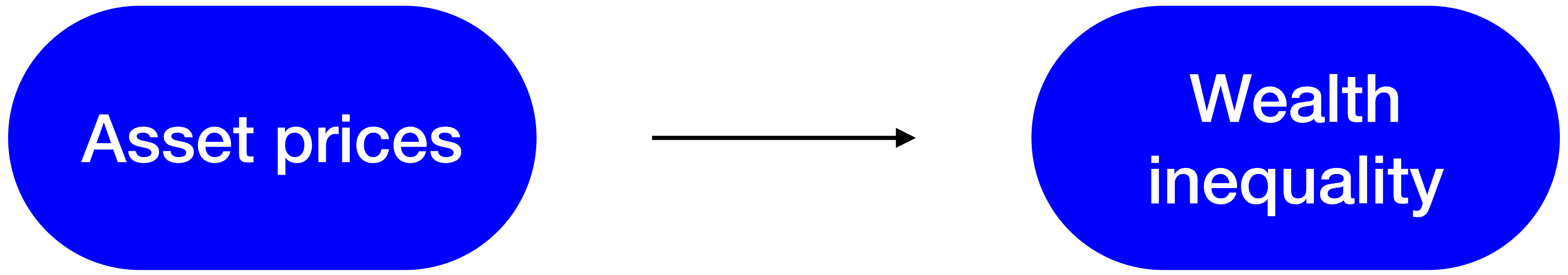
US nonfinancial corporate businesses

Conventional view in asset pricing



Bordalo-Gennaioli-La Porta-OBrien-Shleifer (2023), following Shiller (1981), Campbell-Shiller (1988), …

How to tax capital gains from rising asset prices?



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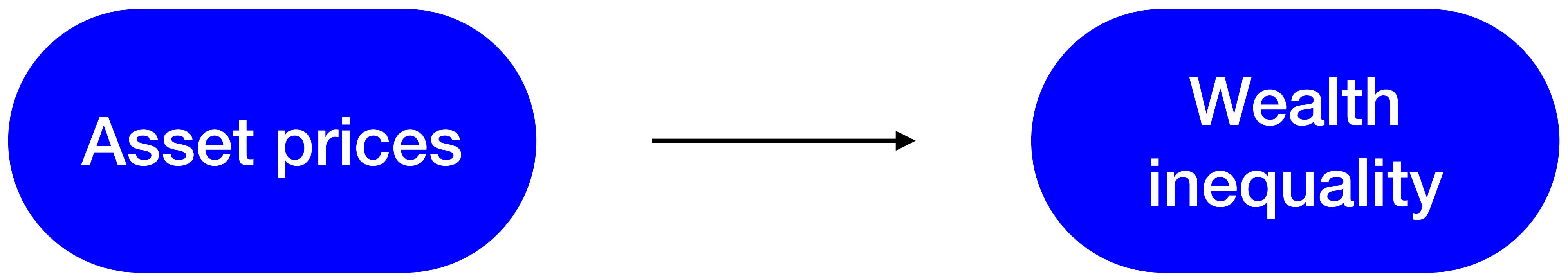

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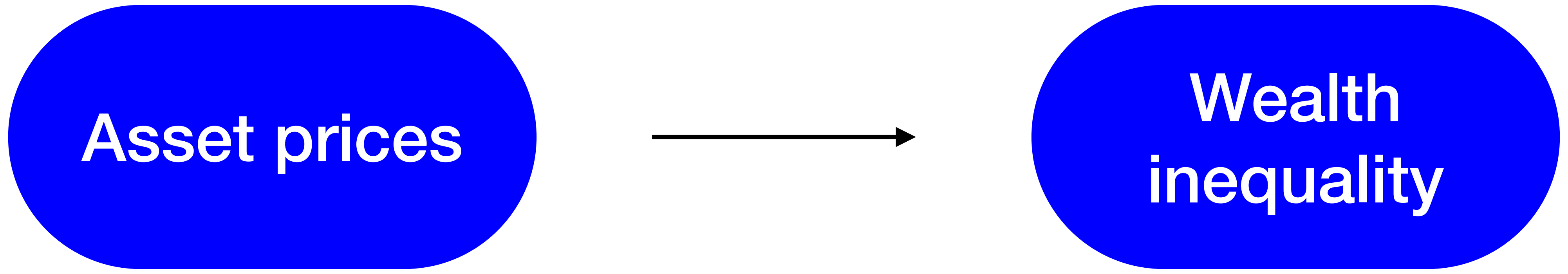

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When asset prices rise, how should optimal tax system adjust?

No guidance from existing theories of capital taxation:

No asset prices!

What we do

Redistributive taxation with changing asset prices

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

dividend yield + capital gain

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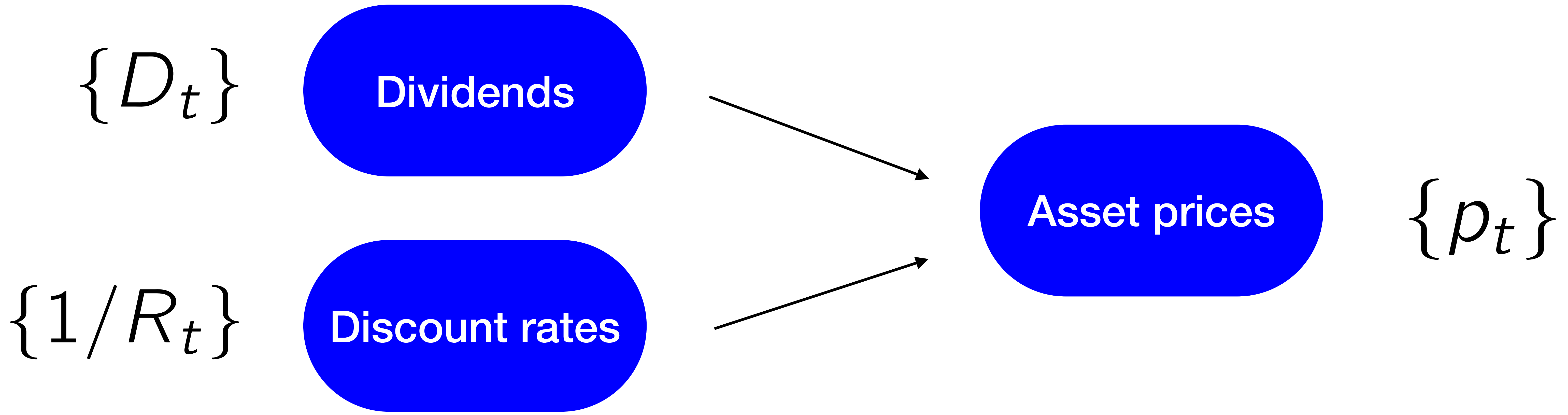
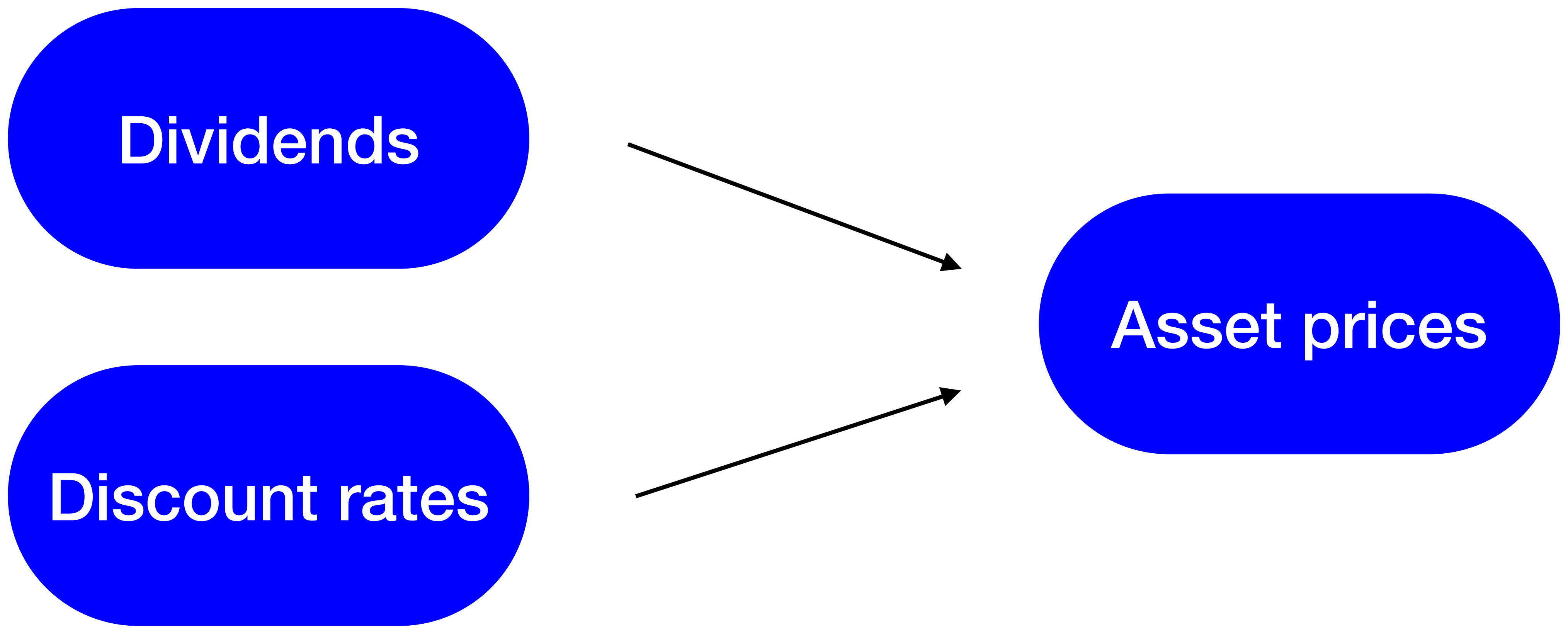
Asset pricing



What we find

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



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Haig-Simons

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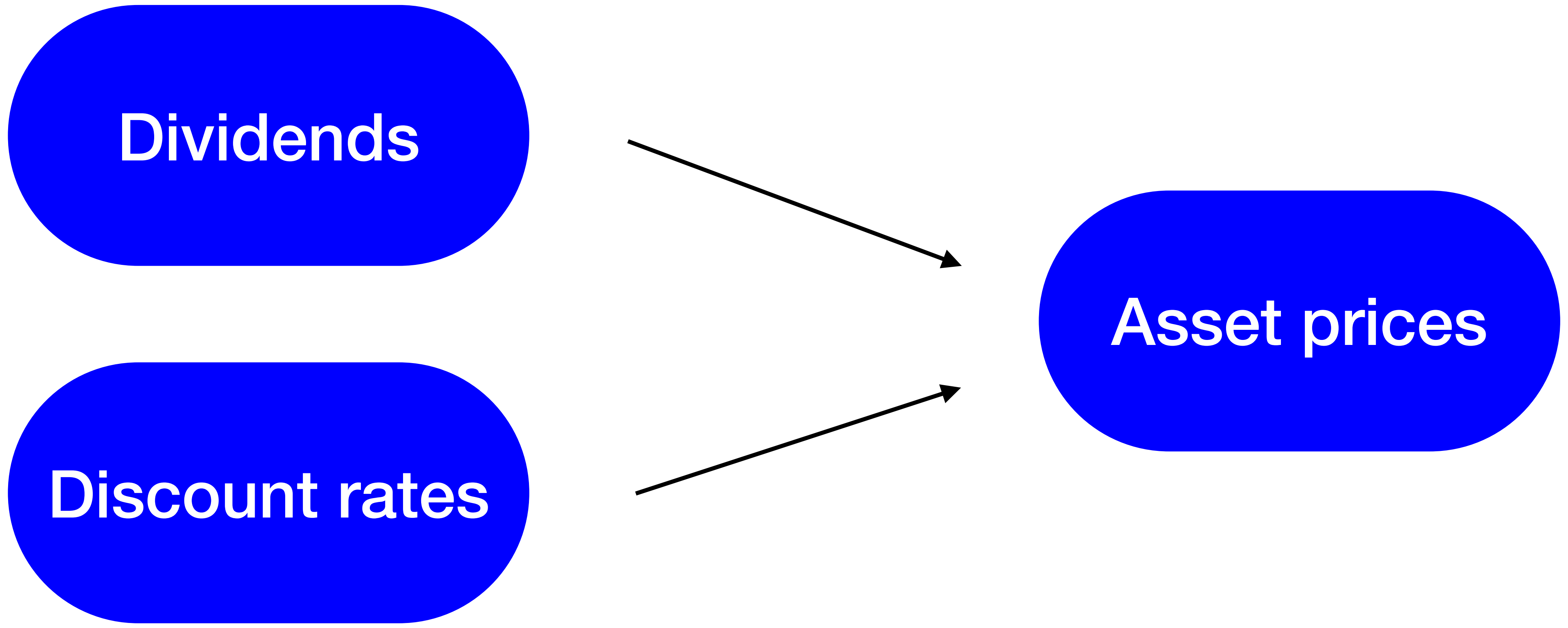

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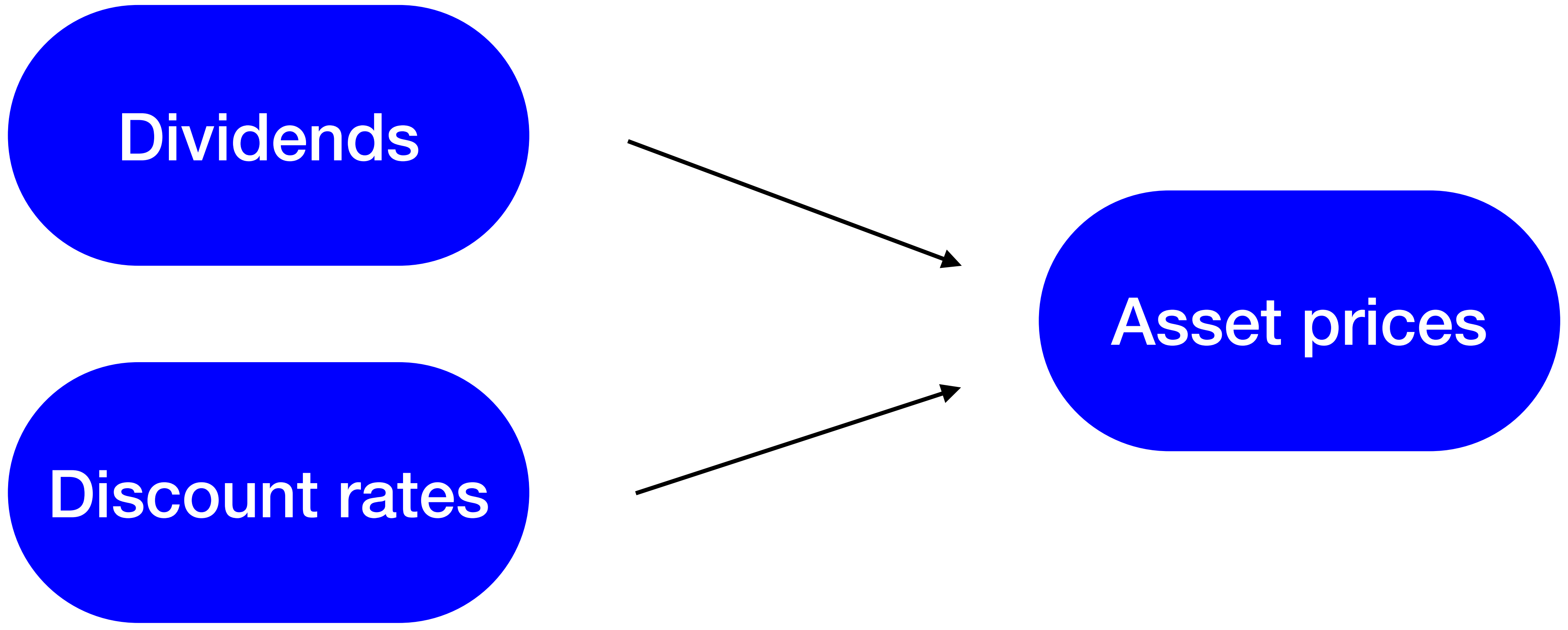

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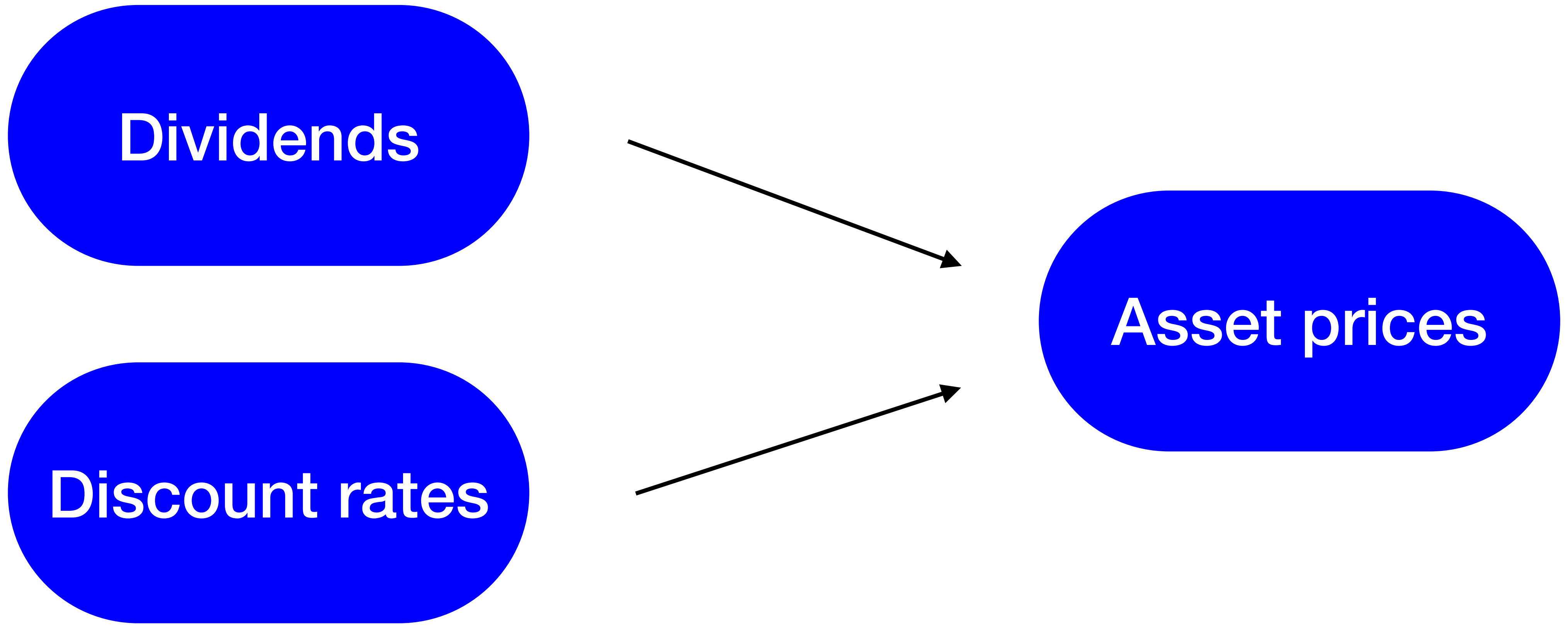

Beyond simplest case: ~~Haig-Simons~~ even with dividend-driven Δp

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

Plan

1. Benchmark model (no risk, partial equilibrium)

2. Two periods

3. First-best

4. Second-best (Mirrlees)

5. Extensions
    - Back to multi-period model
    - General equilibrium
    - Heterogeneous returns
    - Risk and borrowing

Environment

Investors

Indexed by $\theta \sim F(\theta)$, differ in initial wealth and income

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

$$k_0 \text{ given}$$

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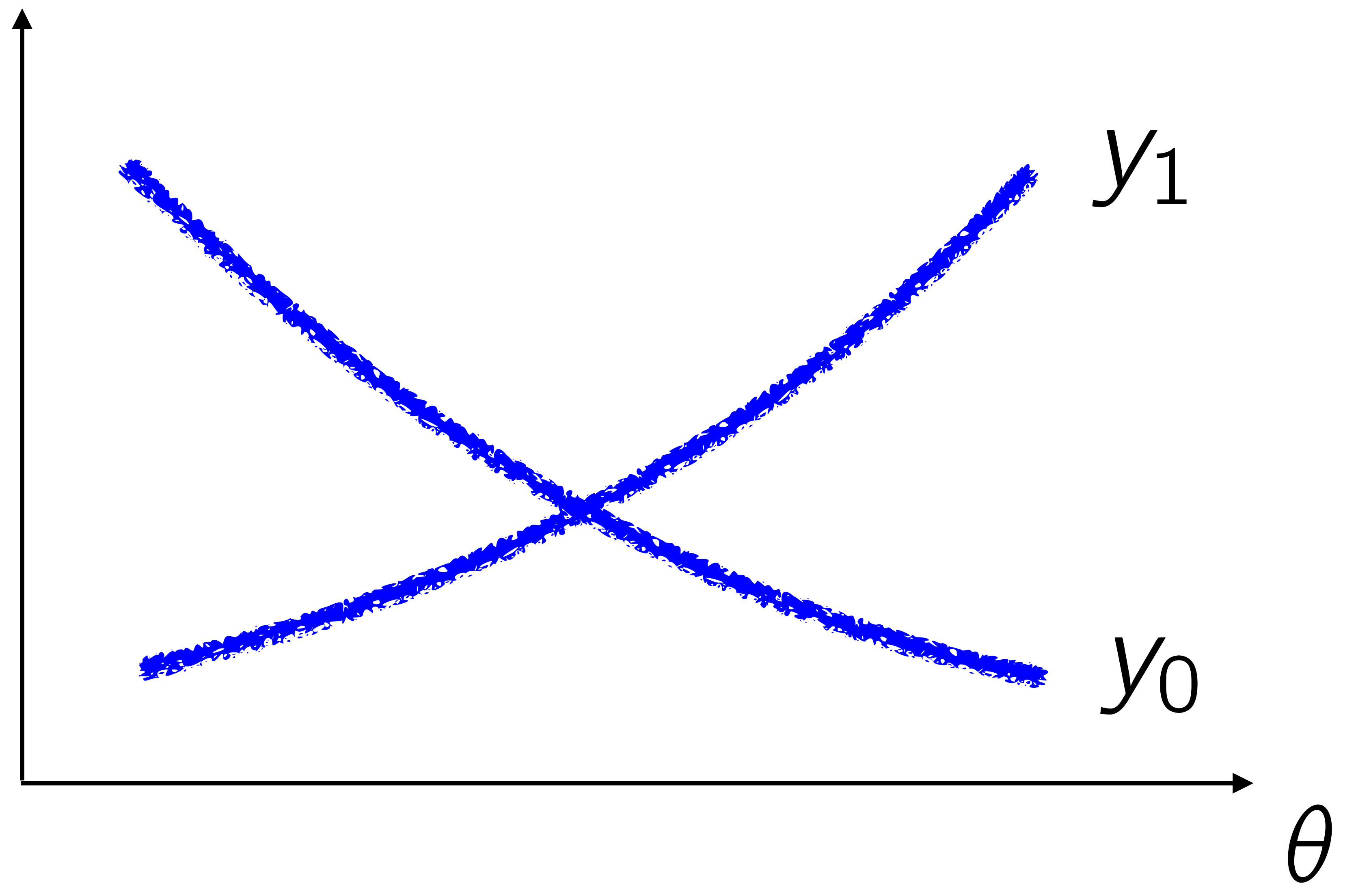

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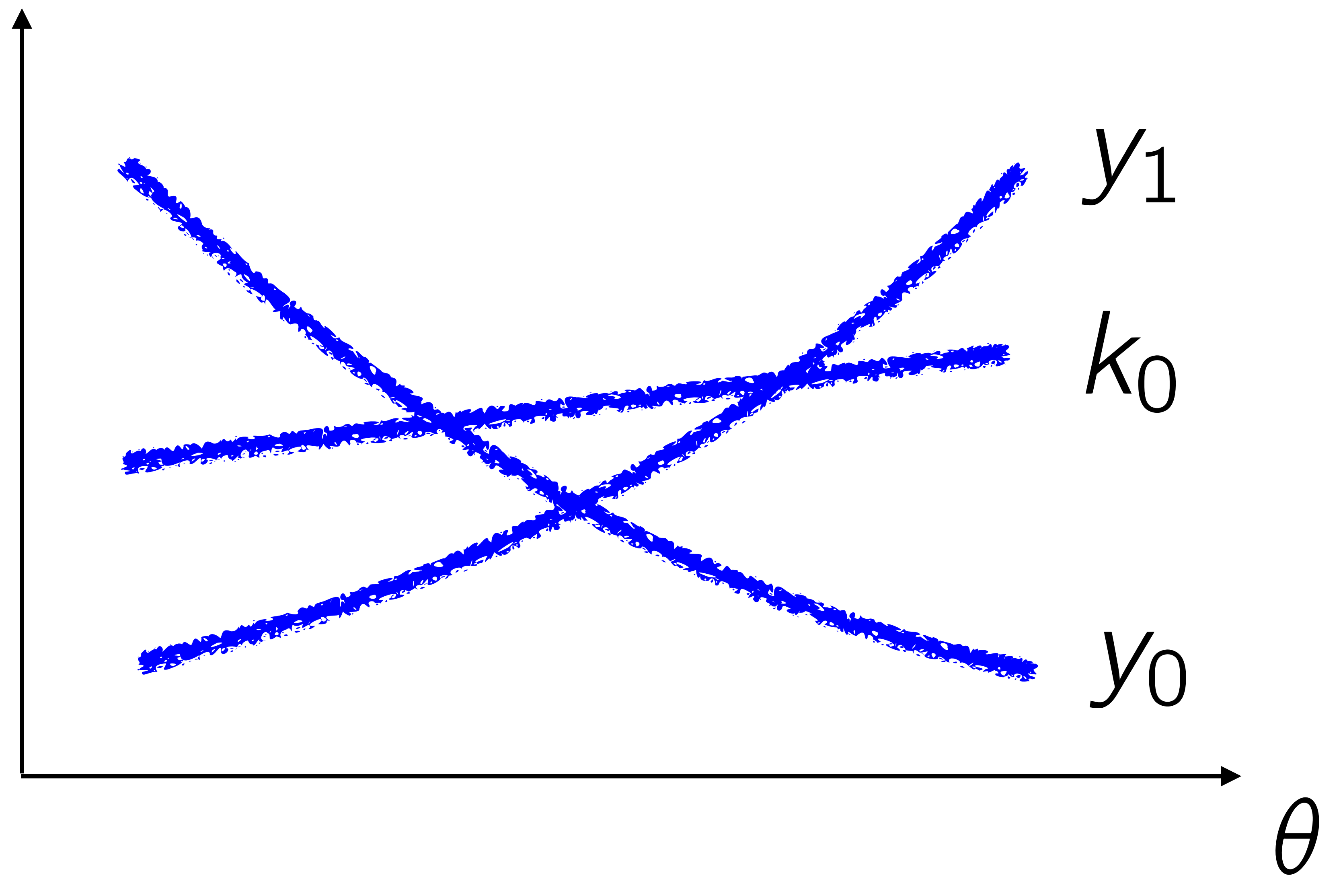

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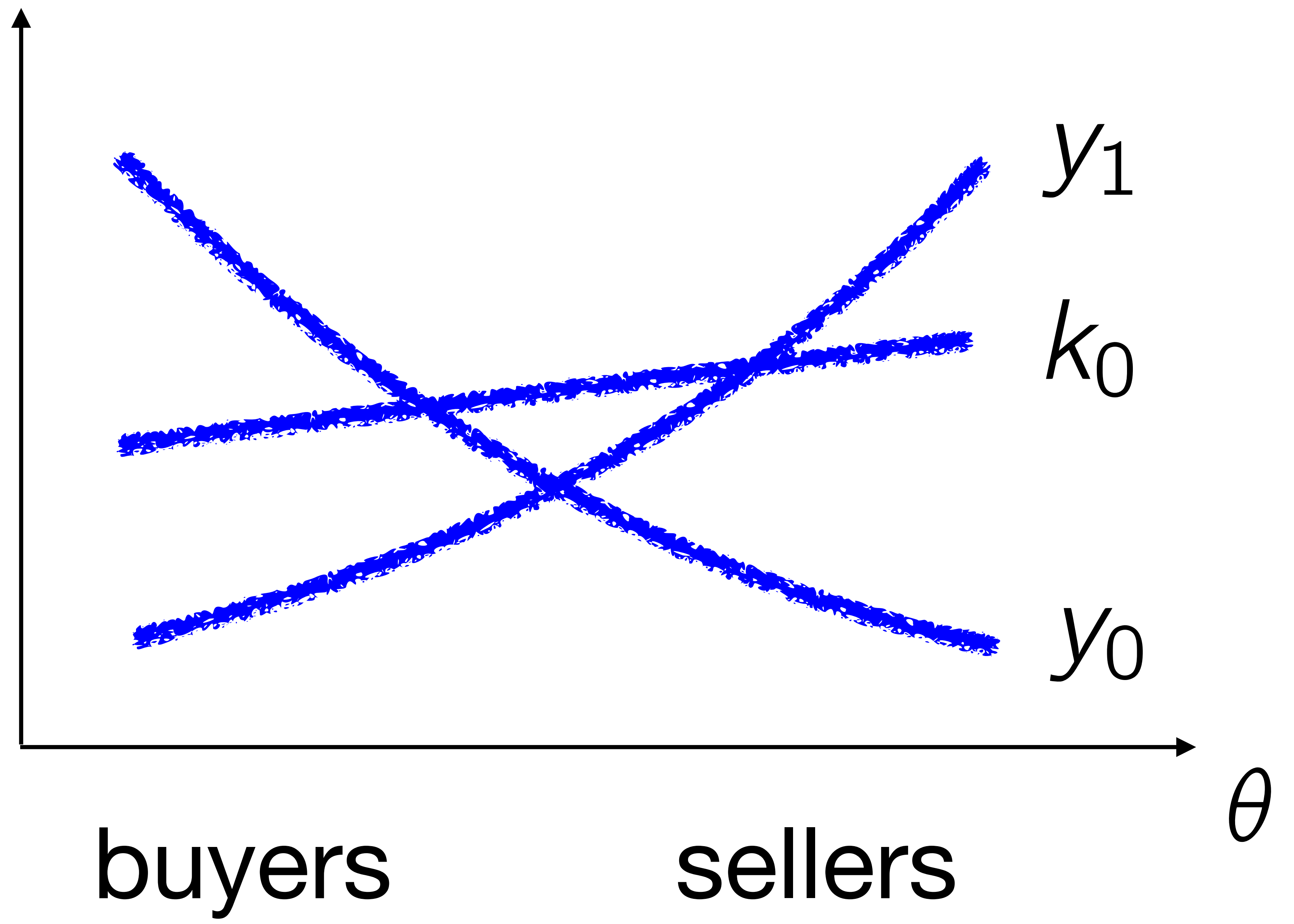

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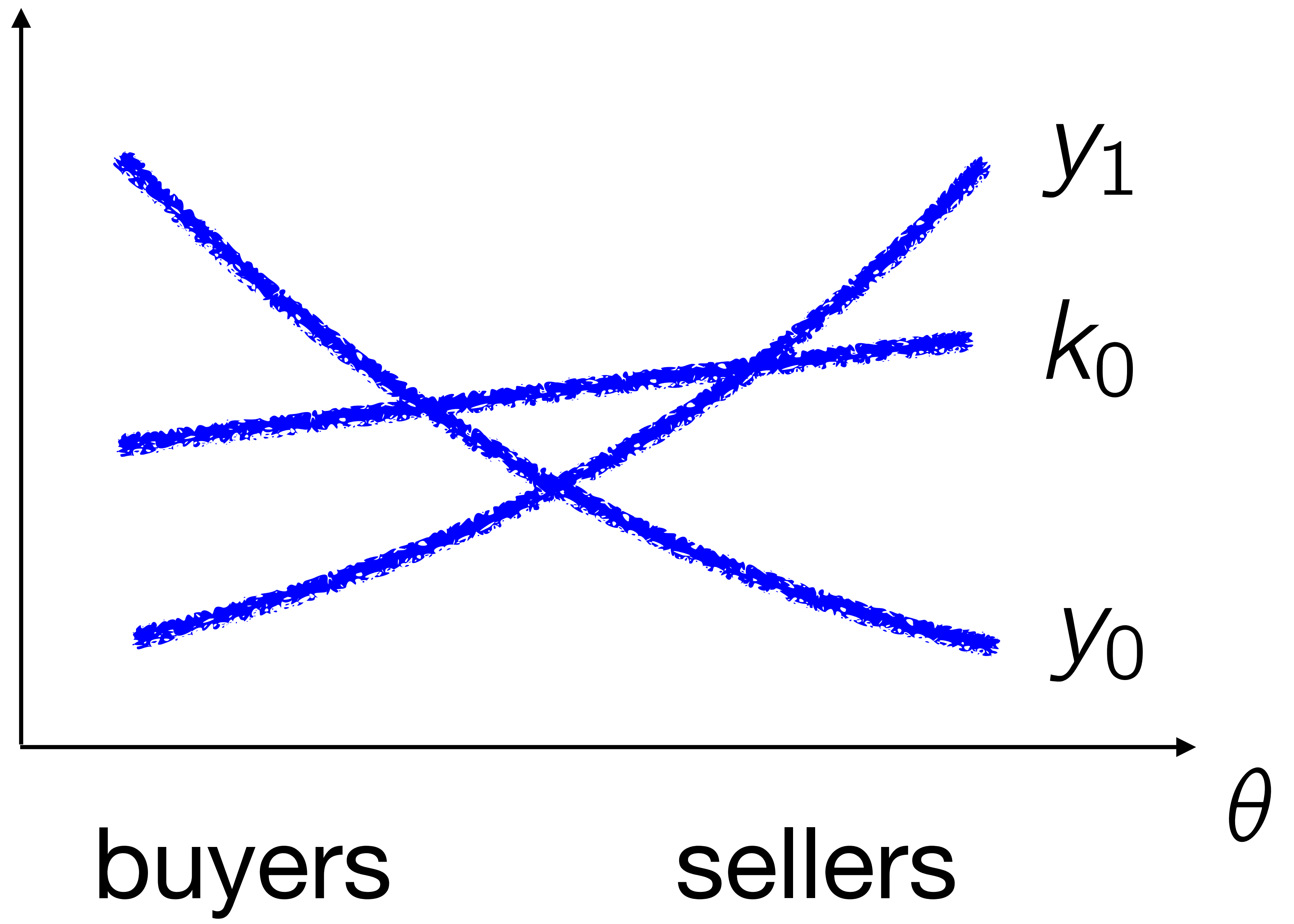

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Add $(p_t - p_{t-1})k_t$ on both sides:

$$c_t + \underbrace{p_t k_{t+1} - p_{t-1} k_t}_{\text{change in wealth}}$$

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

Investors

Literature

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Two periods

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asset sales $x = k_0 - k_1$

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Resource constraints

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

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

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First-best

Pareto problem

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

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

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

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

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

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- Sales x at **new** price
- Tax on **net** transactions
- **Subsidy** if $x < 0$

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Trading gains and losses

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

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

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

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

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

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aggregate wealth

100% tax on wealth increase

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- In general, tax must depend on realizations

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Consumption Tax

Second-best

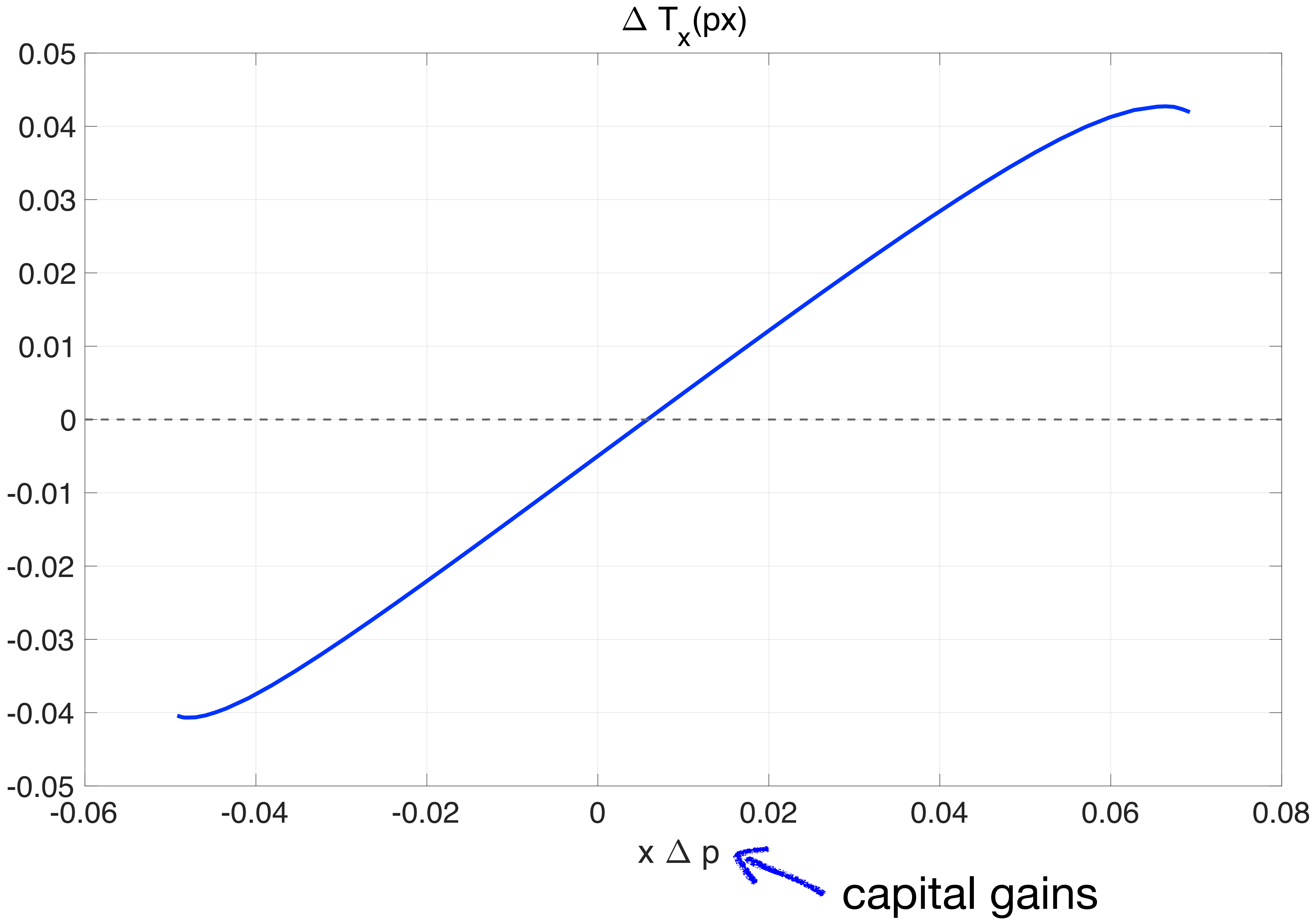
Distortive nonlinear taxes

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



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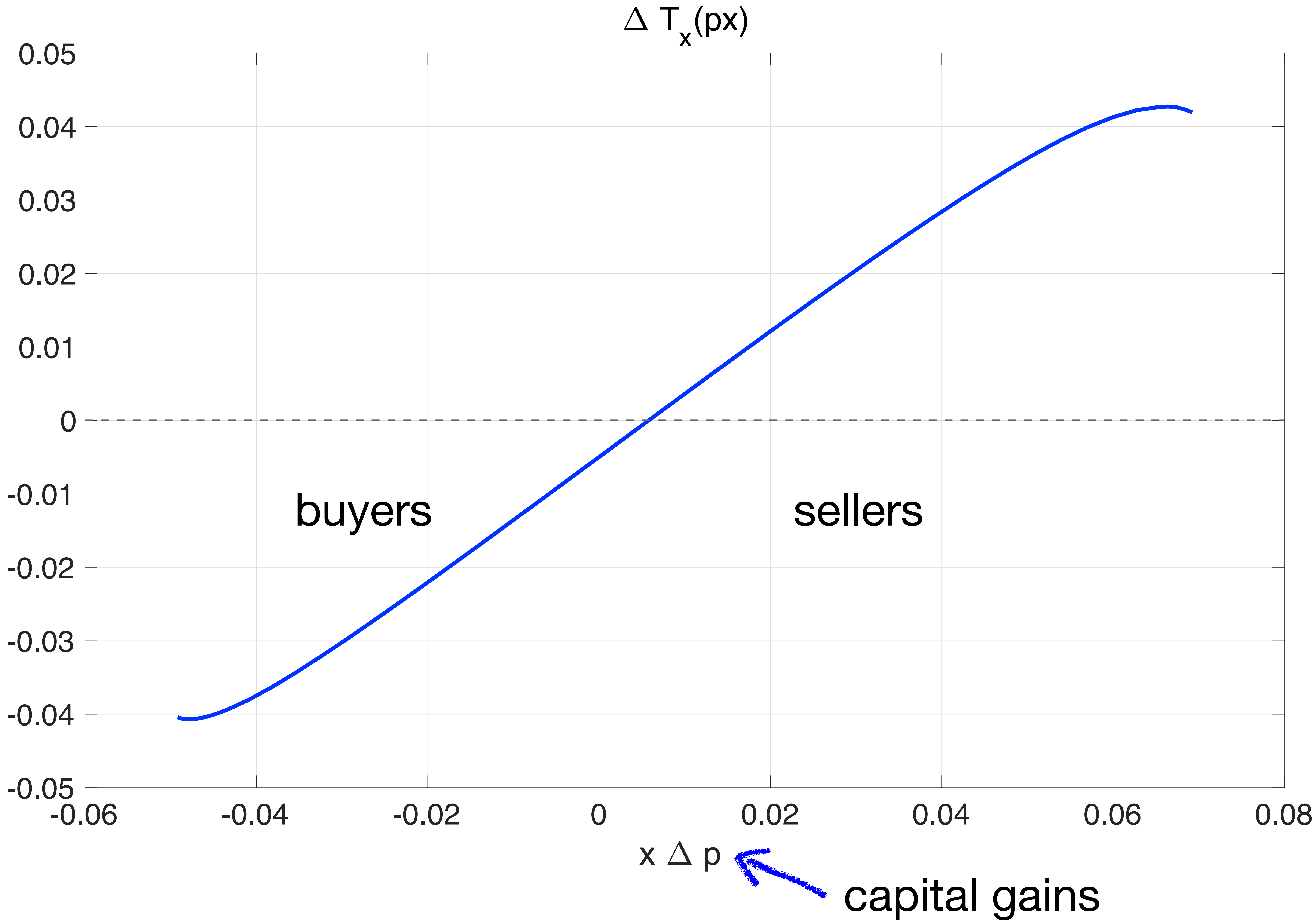
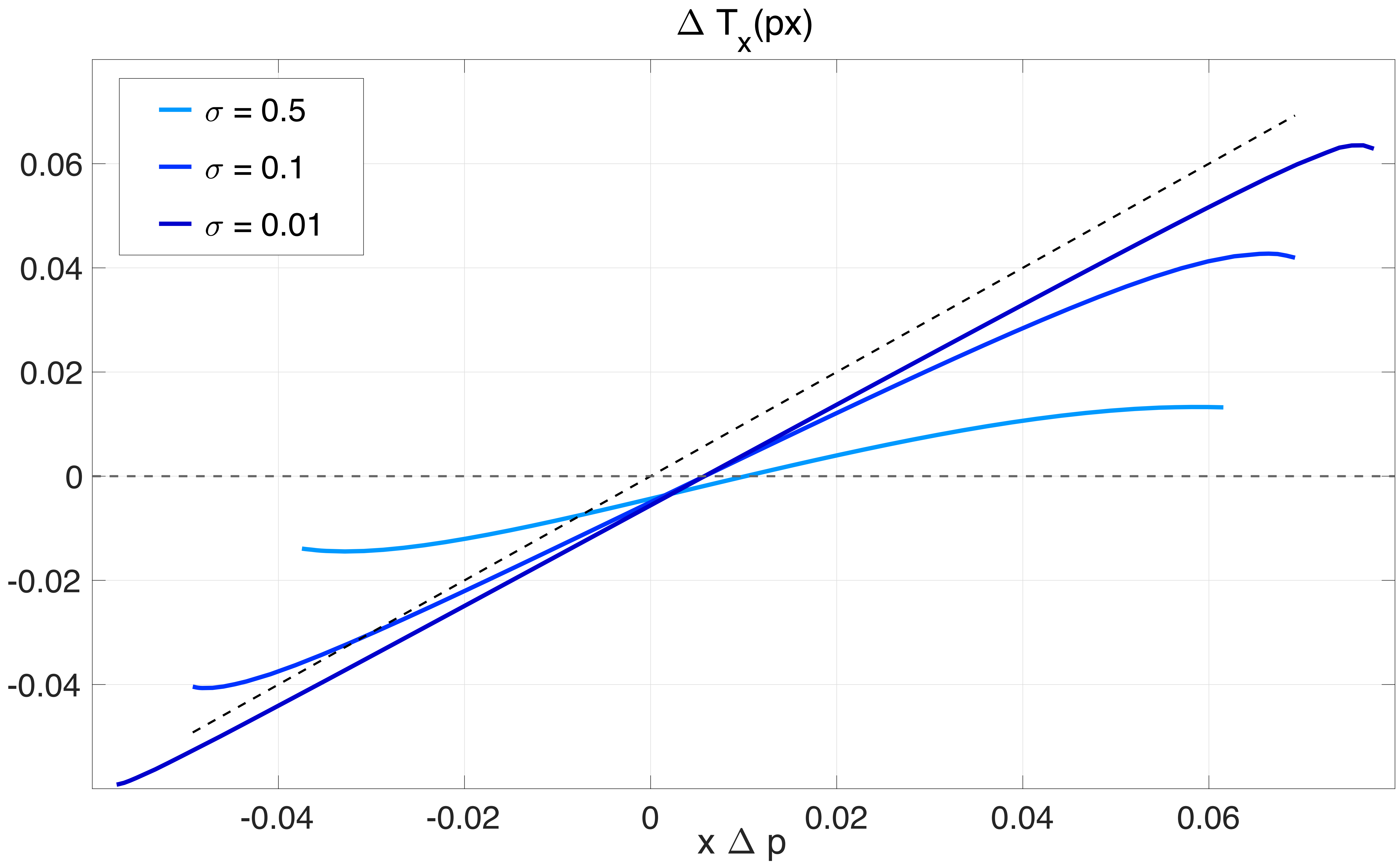


Role of the IES



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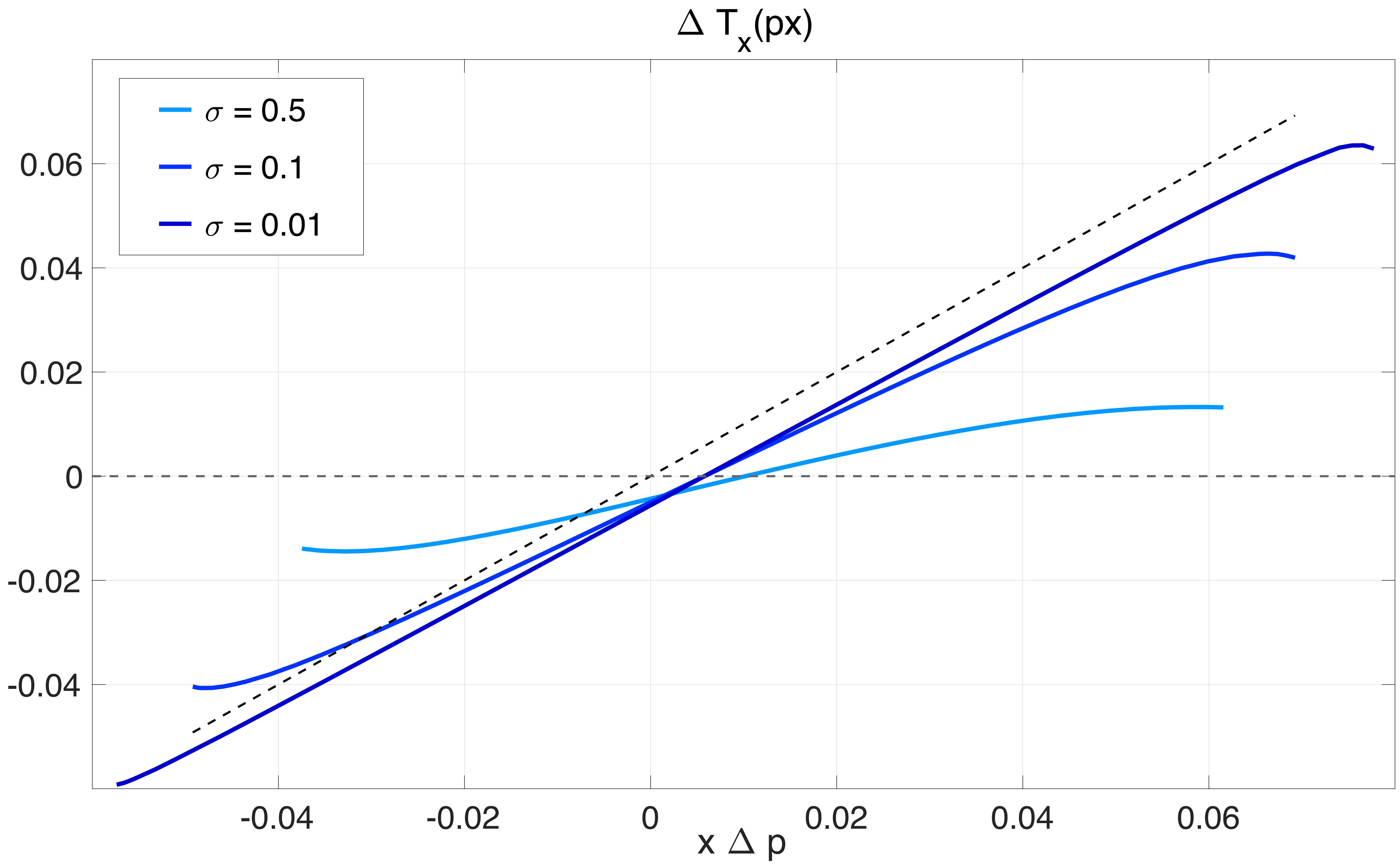
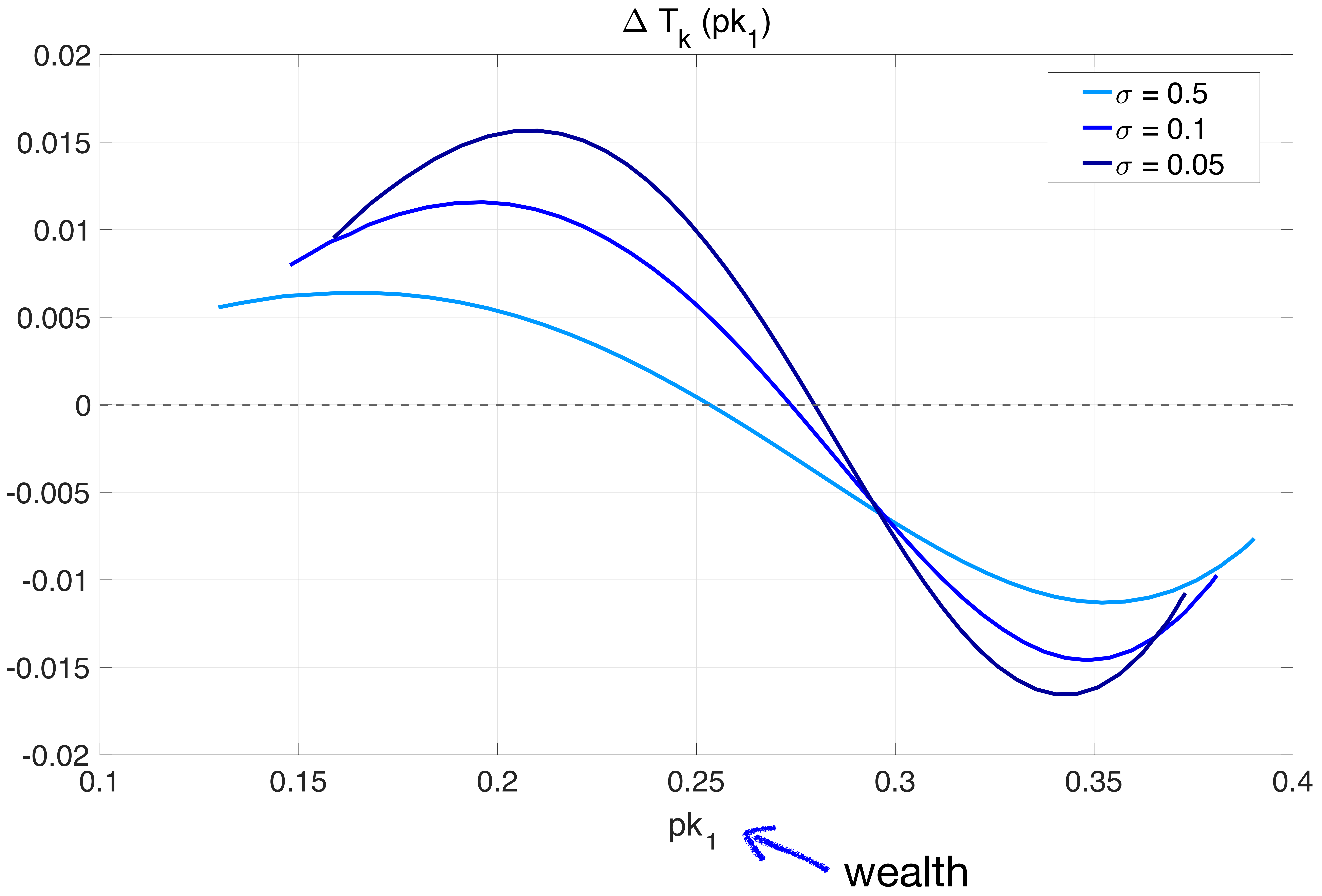


Proposition: Suppose $V'_{FB}(\theta) \in [y'_0(\theta), Dk'_0(\theta) + y'_1(\theta)]\ \forall\theta$. Then the solution to the second-best problem converges to the first-best allocation as $\sigma \to 0$.

Wealth tax

Taxes in levels



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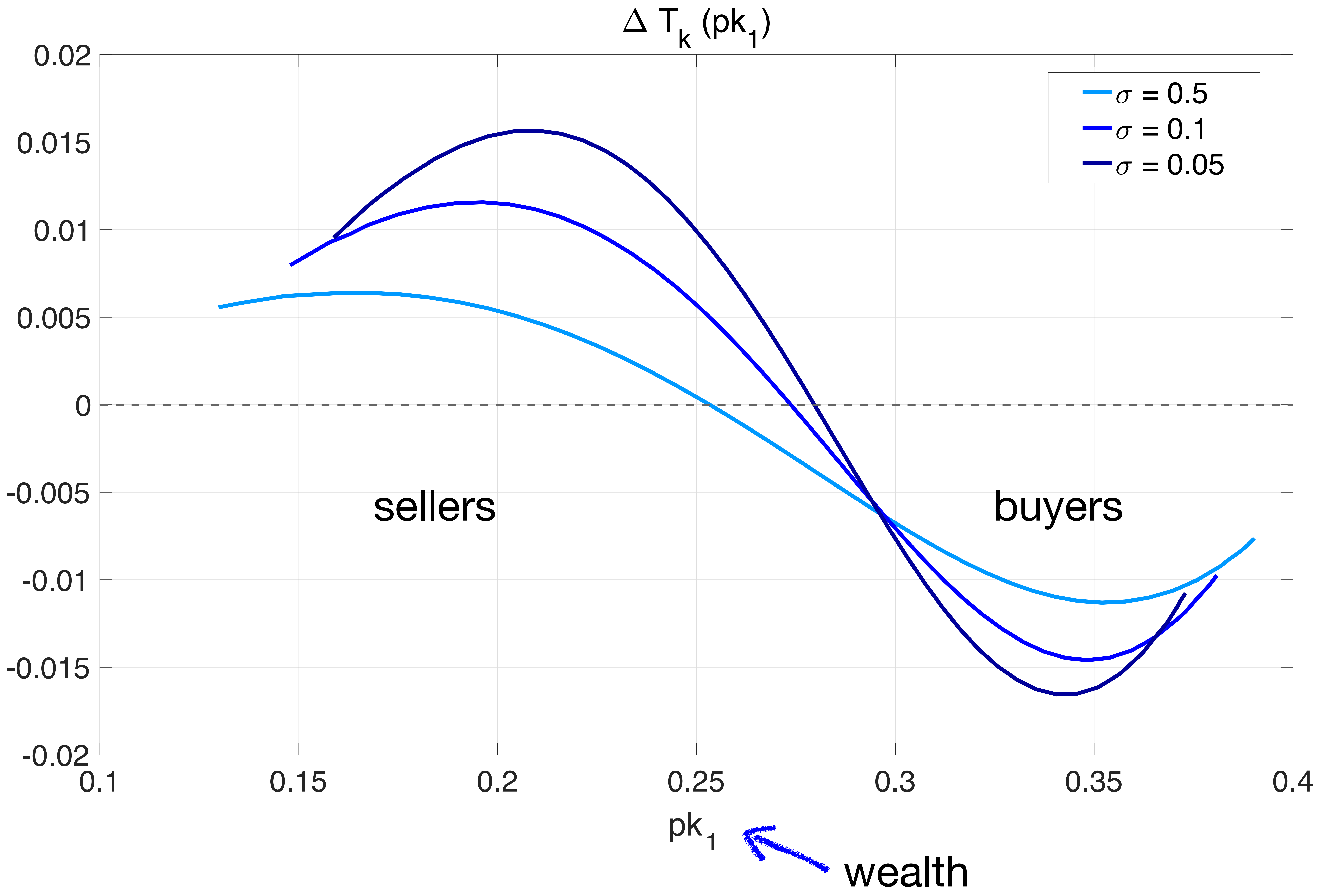

Extensions

1. Back to multi-period model
2. General equilibrium
3. Heterogeneous returns
4. Risk and borrowing

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 dividend-driven asset price changes
  - Often redistribute in "wrong" direction

Lifecycle

Investors

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

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

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Rates of return:

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

Lifecycle

Proposition: Suppose asset prices change by $\{\Delta p_t\}_{t=0}^{T}$ and dividends by $\{\Delta D_t\}_{t=0}^{T}$. The change in the optimal taxes $\{\Delta T_t(\theta)\}_{t=0}^{T}$ is such that

$$\sum_{t=0}^{T} R_{0\to t}^{-1} \Delta T_t(\theta) = \sum_{t=0}^{T} R_{0\to t}^{-1} [x_t(\theta)\Delta p_t + k_t(\theta)\Delta D_t - \Omega(\theta)(X_t \Delta p_t + K_t \Delta D_t)]$$

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Example: $\Delta T_t(\theta) = x_t(\theta)\Delta p_t + k_t(\theta)\Delta D_t - \Omega(\theta)(X_t \Delta p_t + K_t \Delta D_t)\ \forall t$

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$$\sum_{t=0}^{T} R_{0\to t}^{-1} \Delta T_t(\theta) = \sum_{t=0}^{T} R_{0\to t}^{-1} [x_t(\theta)\Delta p_t + k_t(\theta)\Delta D_t - \Omega(\theta)(X_t \Delta p_t + K_t \Delta D_t)]$$

Example: $\Delta T_t(\theta) = x_t(\theta)\Delta p_t + k_t(\theta)\Delta D_t - \Omega(\theta)(X_t \Delta p_t + K_t \Delta D_t)\ \forall t$

Special case: $\dfrac{\Delta D_{t+1} + \Delta p_{t+1}}{\Delta p_t} = \dfrac{D_{t+1} + p_{t+1}}{p_t}$ i.e., $R_{t\to t+1}$ unchanged. Then

collapse back to $\sum_{t=0}^{T} R_{0\to t}^{-1} \Delta T_t(\theta) = [k_0(\theta) - \Omega(\theta) K_0]\, \Delta p_0$

$$\Delta p_0 = \sum_{t=1}^{T} R_{0\to t}^{-1} \Delta D_t$$

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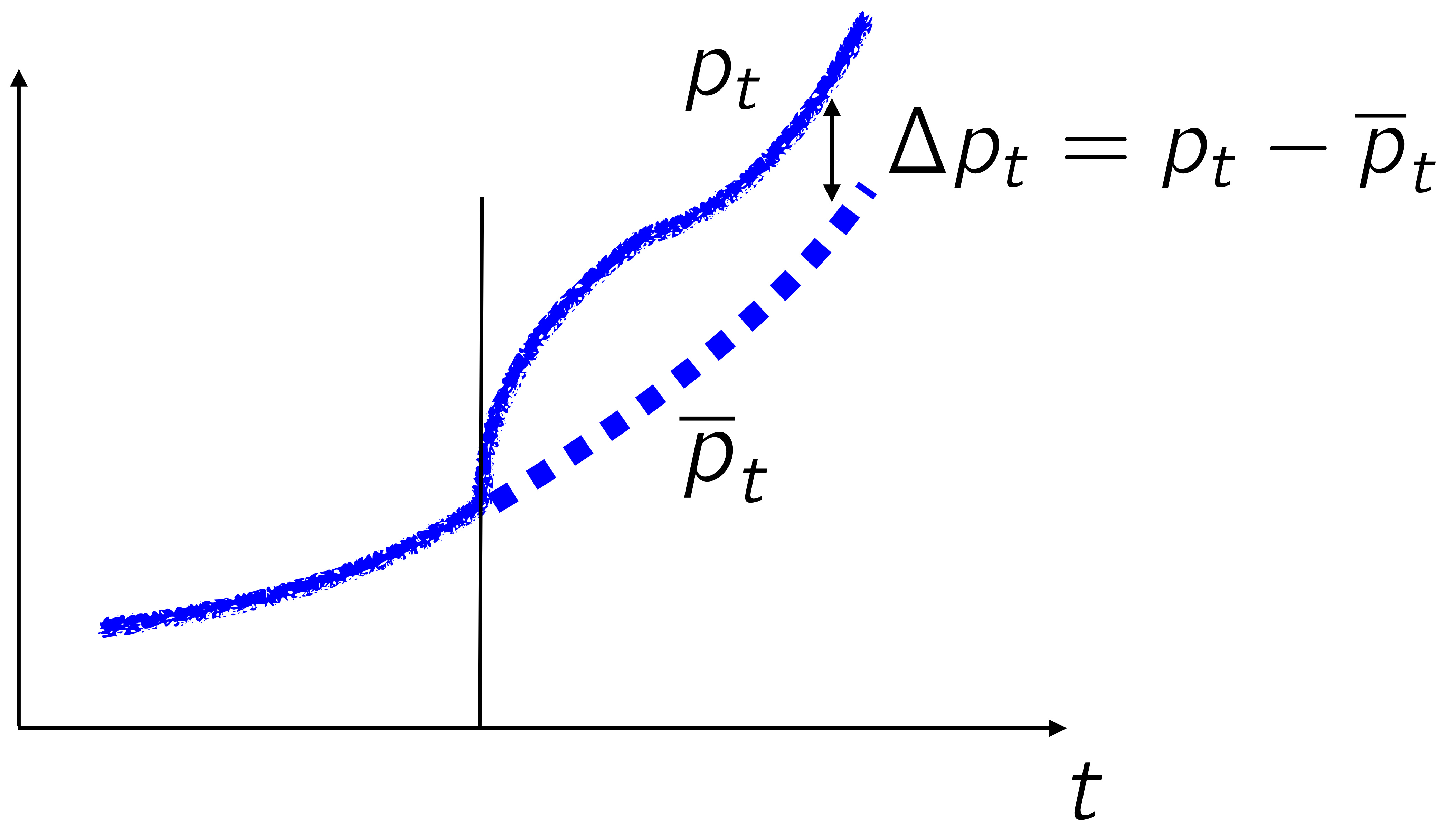
What are Δp and ΔD? An example

Back

$$\Delta T_t(\theta) = x_t(\theta)\Delta p_t + k_t(\theta)\Delta D_t - \Omega(\theta)(X_t \Delta p_t + K_t \Delta D_t)\ \forall t$$

Old BGP: $\overline{D}_t = G^t \overline{D}_0 \quad \overline{R}_{t\to t+1} = \overline{R} \quad \overline{p}_t = G^t \overline{p}_0$



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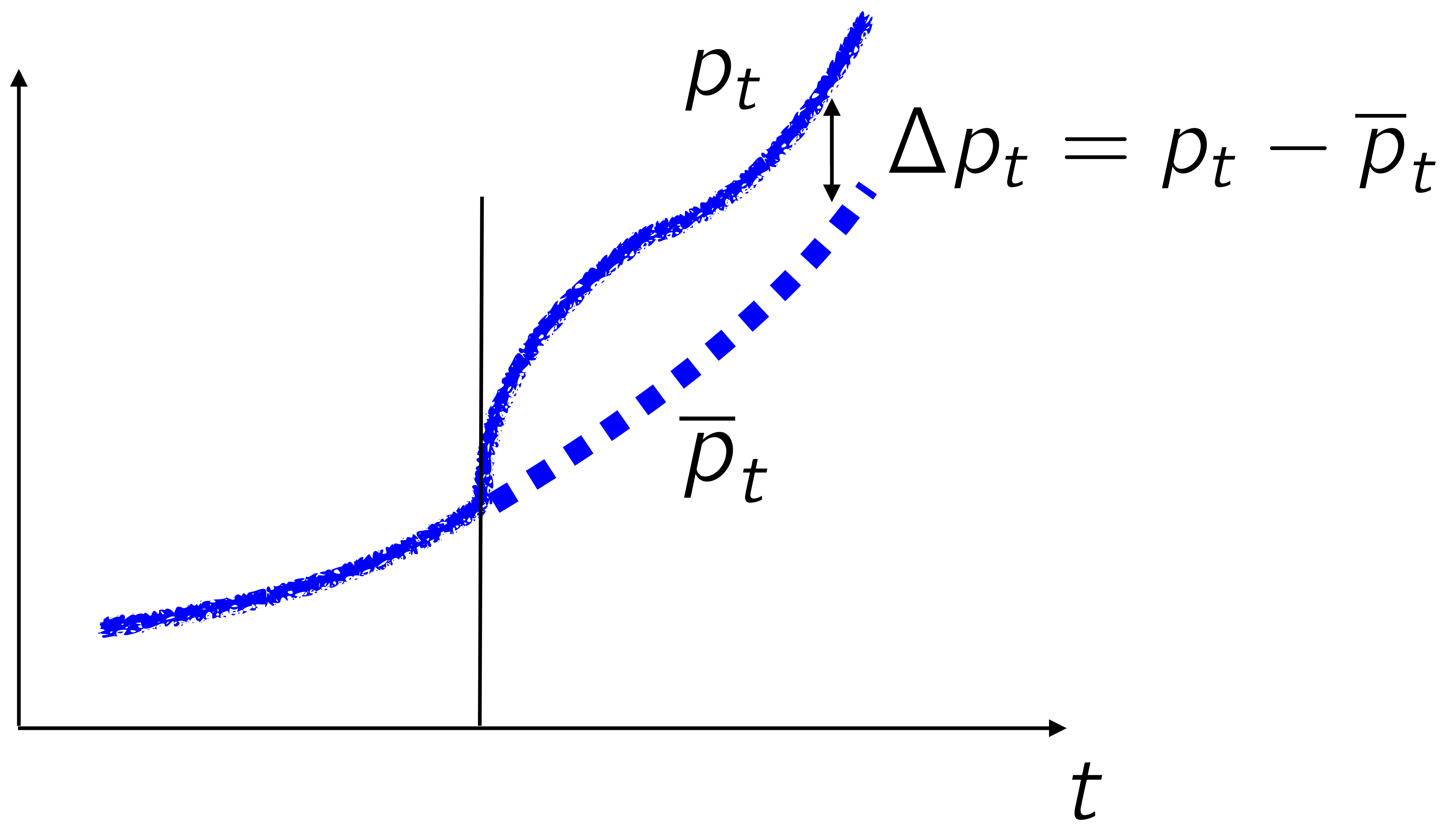

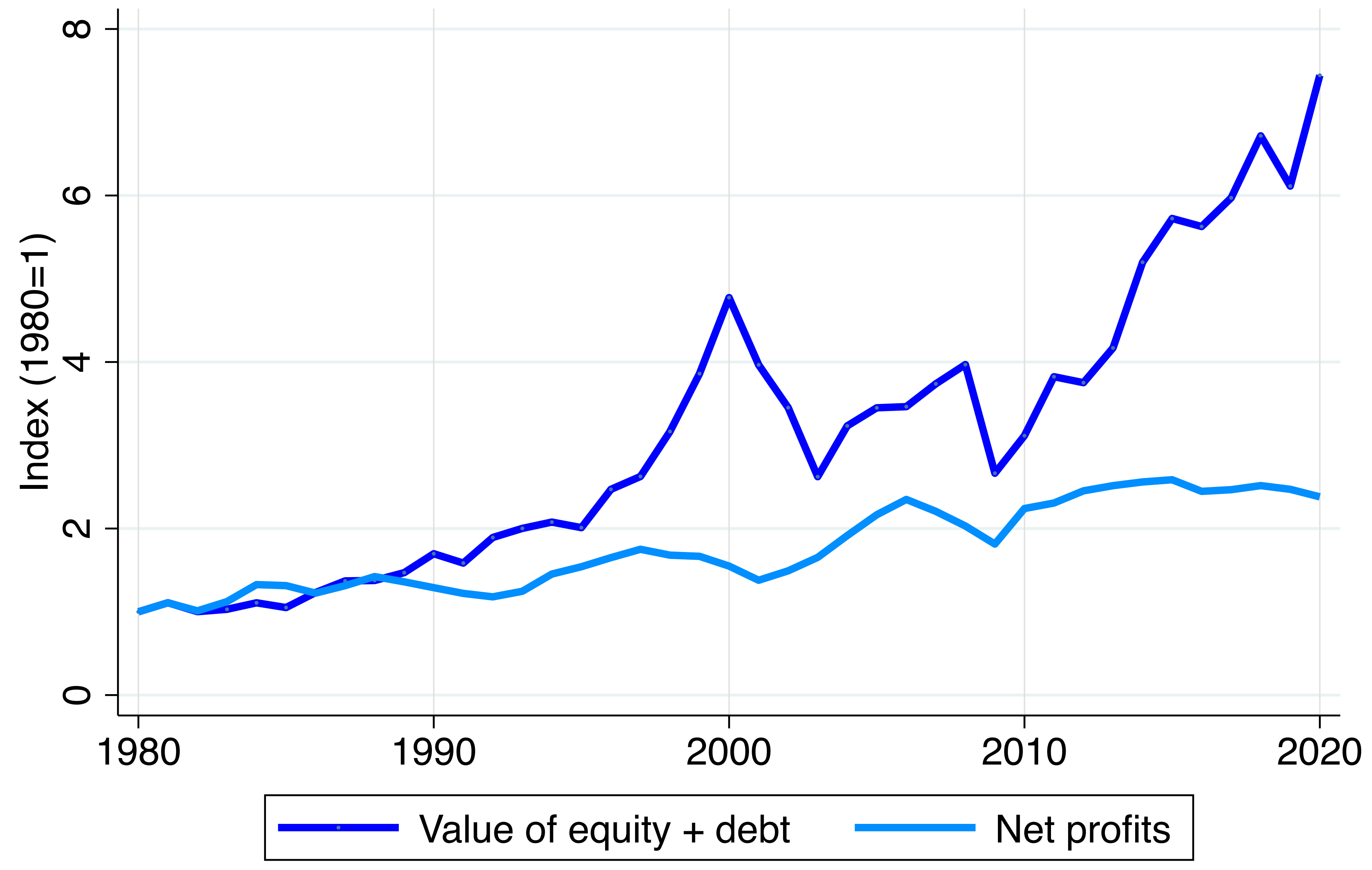

General equilibrium

Equilibrium asset price

Back

Suppose capital is in fixed supply $K_0 = K_1 = K$

Asset price p^* adjusts to clear market:

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

Equilibrium asset price

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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

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

$$c_1 = Dk_1 + b + y_1$$

Trading with adjustment costs

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convex adjustment cost

$\theta \sim F(\theta)$

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convex adjustment cost

$\theta \sim F(\theta)$

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

Back

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

Then $p^* = q\overline{D}$

average dividend

Heterogeneous returns in GE

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

Then $p^* = q\overline{D}$

average dividend

Asset price changes for everyone when *some* dividends change…

… even for investors whose dividends did not change!

Heterogeneous returns in GE

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average dividend

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Risk and borrowing

Two assets

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

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

$$c_1(s) = D(s)k_1 - b + y_1 - T_1(s)$$

risk-free bond

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

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risk-free bond

Asset prices:

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

Arrow-Debreu prices

First-best problem

$$\int T_1(\theta, s)dF(\theta) = 0 \ \forall s$$

Individual lump-sum taxes $T_0(\theta), T_1(\theta, s)$

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

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

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

Changing Arrow-Debreu prices

Back

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

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

aggregate bond holdings

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aggregate bond holdings

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

Comparison to capital taxation literature

Back

1. Partial equilibrium models (Atkinson-Stiglitz…) with constant $R_t = \overline{R}$
2. Neoclassical growth model (Chamley…): depends and decentralisation
   - always: unit price of capital =1, $R_{t+1} = \frac{1}{\beta} \frac{U'(c_t)}{U'(c_{t+1})}$
   - asset = capital: $p_t = 1 \quad \Rightarrow$ no capital gains
   - asset = shares in representative 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 heterogeneous households (Judd, Werning, Straub-Werning…)
   - same as 2.
4. Our setup: allow flexibly for discount rate variation

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.

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Kaldor's Expenditure Tax

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Optimal wealth tax schedule

Back