# Taxes, Regulations, and the Value of US Corporations: A Reassessment

Ellen McGrattan

University of Minnesota

Data and codes available at users.cla.umn.edu/∼erm/data/sr647

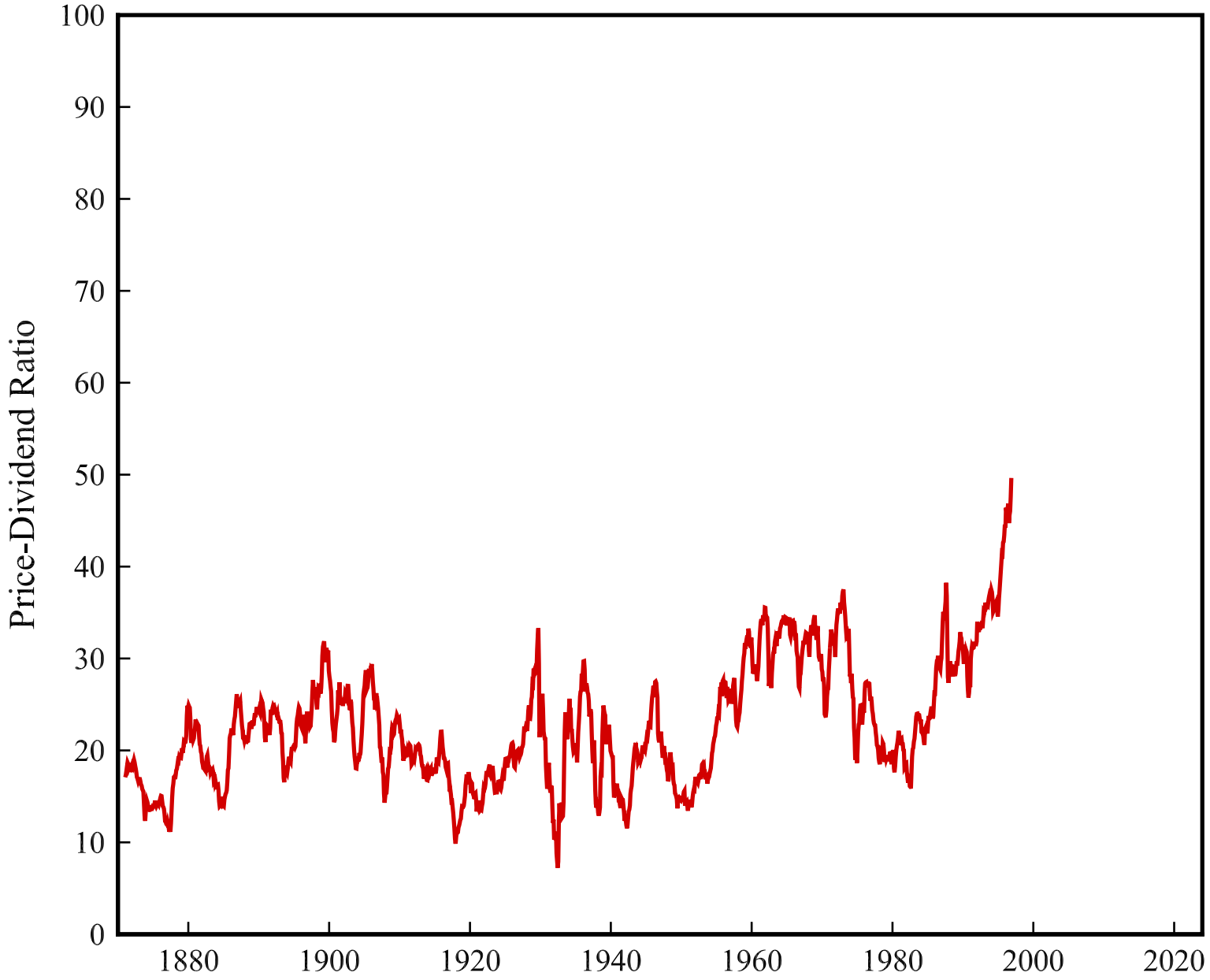
# The Story Begins in December of 1996

# Campbell and Shiller

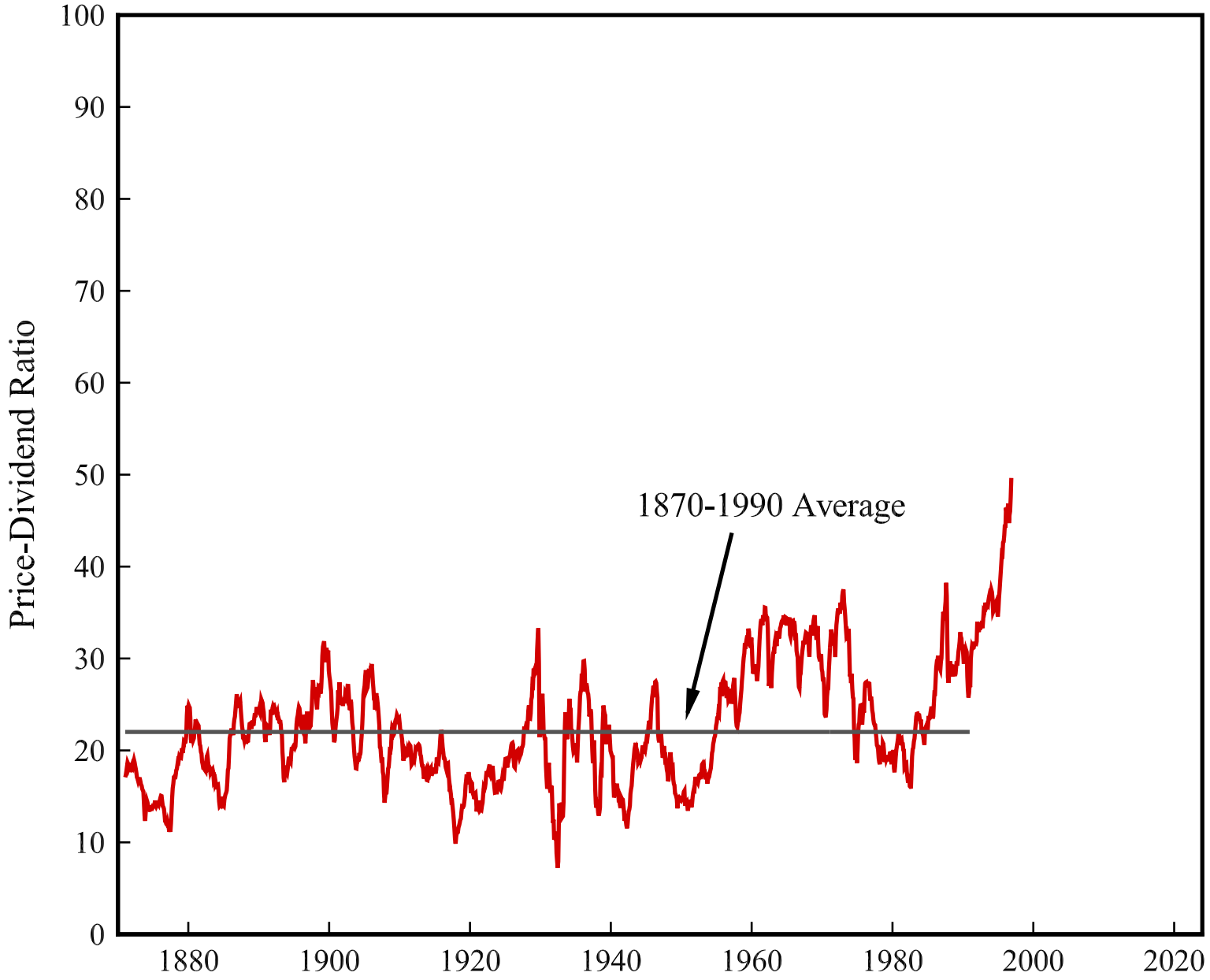
- Testified before Fed Board on 12/3/96
  - Price-dividend ratios historically high
  - Reversion to mean likely

- What were they seeing?

# S&P Price-Dividend Ratio, 1871:01–1996:11



# S&P Price-Dividend Ratio, 1871:01–1996:11



# Meanwhile

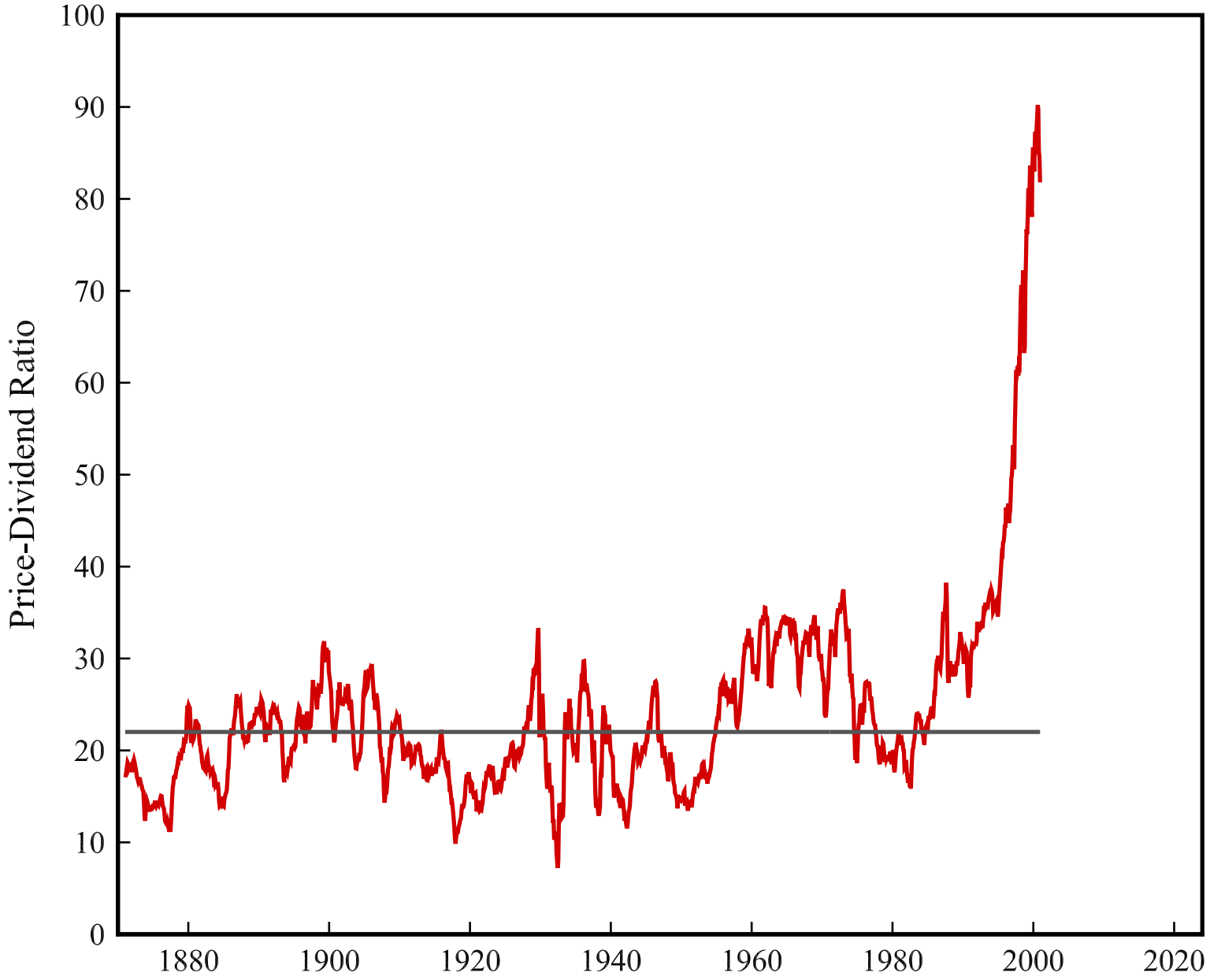
- Greenspan publicly worried about irrational exuberance
- Prescott privately worried he invested too much in stocks!

# Fast Forward to 2001

- Campbell and Shiller updated their analysis
  - Price-dividend ratios were even higher
  - Reversion to mean very likely

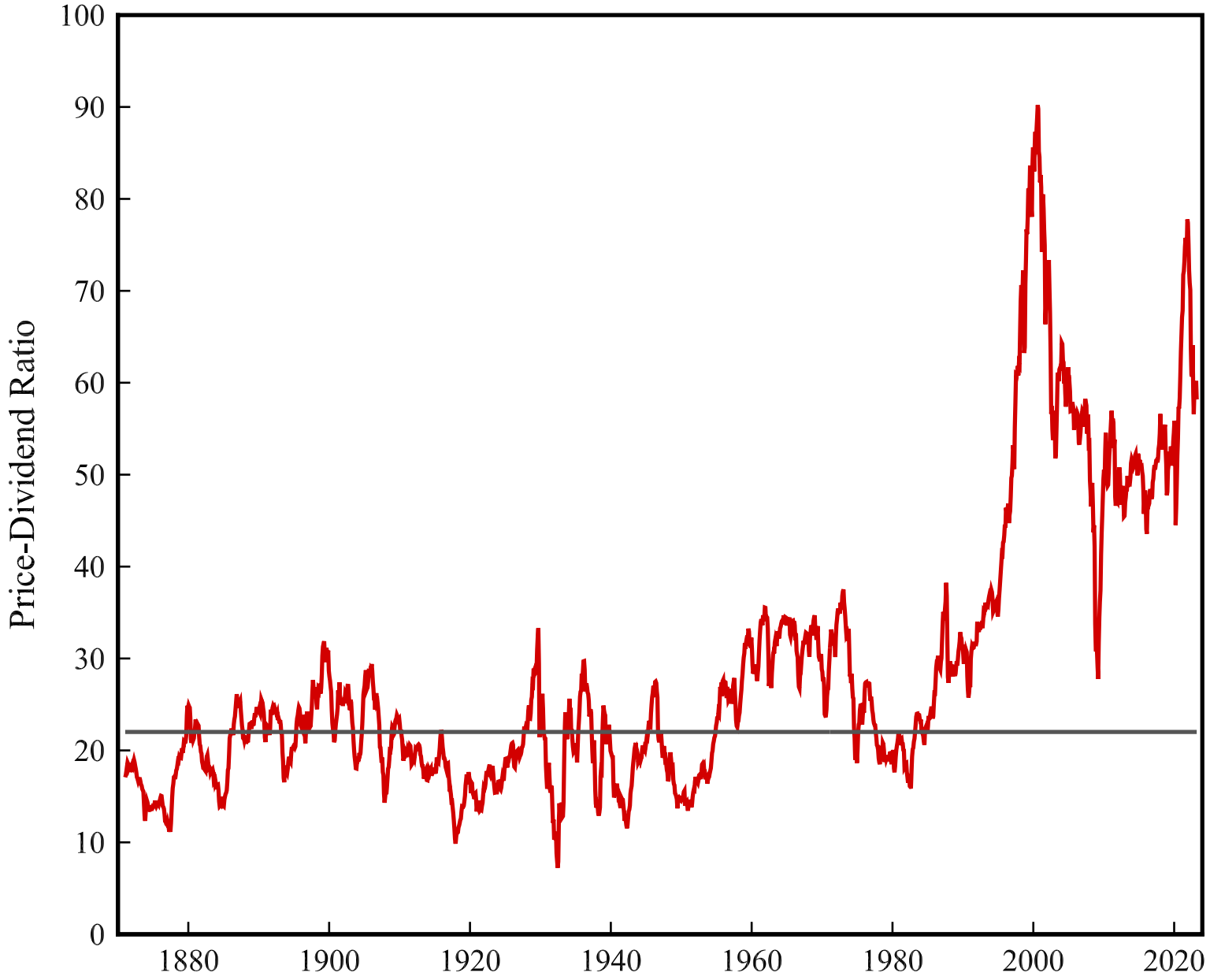
- What were they seeing?

# S&P Price-Dividend Ratio, 1871:01–2000:12



## What would Campbell and Shiller conclude today?

# S&P Price-Dividend Ratio, 1871:01–2023:03



# Was/Is the Market Overvalued?

# Let's Start with the Most Basic Theory

- Household $i$ solves:

$$\max \; E_0 \sum_t \beta^t U(c_{it}, n_{it})$$

$$s.t. \; \sum_t p_t \{c_{it} + v_t(s_{i,t+1} - s_{it})\}$$

$$\leq \sum_t p_t \{d_{it} s_{it} + w_t n_{it}\}$$

- Corporation $j$ solves:

$$\max \; E_0 \sum_t p_t d_{jt}$$

$$s.t. \; d_{jt} = F(k_{jt}, z_t n_{jt}) - x_{jt} - w_t n_{jt}$$

$$k_{j,t+1} = (1 - \delta) k_{jt} + x_{jt}$$

# Corporate Value

- Main theoretical prediction: $V_t = K_t$
  - $V_t = v_t \sum_i s_{it}$ = value of outstanding shares
  - $K_t = \sum_i k_{jt}$ = value of corporate fixed assets

# Corporate Value

- Main theoretical prediction: $V_t = K_t$
  - $V_t = v_t \sum_i s_{it}$ = value of outstanding shares
  - $K_t = \sum_i k_{jt}$ = value of corporate fixed assets
- Easy to prove:
  - Take first-order conditions for corporation
  - Substitute into corporate objective and cancel terms

# Corporate Value

- Main theoretical prediction: $V_t = K_t$
  - $V_t = v_t \sum_i s_{it}$ = value of outstanding shares
  - $K_t = \sum_i k_{jt}$ = value of corporate fixed assets
- Is theory consistent with observations?

# Corporate Value

- Main theoretical prediction: $V_t = K_t$
  - $V_t = v_t \sum_i s_{it}$ = value of outstanding shares
  - $K_t = \sum_i k_{jt}$ = value of corporate fixed assets

- Sad news for theory:
  - $K_t/\text{GDP}_t \approx 1$ over recorded history
  - $V_t/\text{GDP}_t \in [.4,2.4]$ and volatile

# Two Important Features Missing

- Intangible capital
- Taxes

# Incorporating Intangibles

- Preferences are same:

  $\sum_{t=0}^{\infty} \beta^t U(c_t, n_t)$

- Corporate technology:

  $y_t = f(k_{T,t}, k_{I,t}, z_t n_t)$

- Variables:

  $c$ = consumption, $\ell$ = leisure, $y$ = output

  $k_I, k_T$ = in/tangible capital, $n$ = labor, $z$ = technology

# Incorporating US Tax System

- Corporate income tax
- Distribution tax
- Labor income tax
- Sales/excise tax
- Property tax

# Incorporating US Tax System

- Corporate income tax
- Distribution tax†
- Labor income tax
- Sales/excise tax
- Property tax

† Not included in "Is the Stock Market Overvalued?" (QR 2000)

# The US Tax System

- and the Corporation:

$$\max \sum_{t=0}^{\infty} p_t \{ y_t - w_t n_t - x_{T,t} - x_{I,t} - \tau_{\text{corp}} \left[ y_t - w_t n_t - \delta_T k_{T,t} - \tau_{\text{prop}} k_{T,t} - x_{I,t} \right] - \tau_{\text{prop}} k_{T,t} + \tau_{T,\text{subs}} x_{T,t} + \tau_{I,\text{subs}} x_{I,t} \}$$

- and the Household:

$$\sum_{t=0}^{\infty} p_t \left\{ (1+\tau_{\text{cons}}) c_t + v_t (s_{t+1} - s_t) \right\} \leq \sum_{t=0}^{\infty} p_t \left\{ (1-\tau_{\text{dist}}) d_t s_t + (1-\tau_{\text{labor}}) w_t n_t + y_{\text{other,t}} \right\}$$

# Main Theoretical Results

# $V$= Value of Corporate Capital $(k_T, k_I)$

$$V_t = (1 - \tau_{\text{dist}}) \left[ (1 - \tau_{T,\text{subs}}) k_{T,t+1} + (1 - \tau_{\text{corp}} - \tau_{I,\text{subs}}) k_{I,t+1} \right]$$

| | |
|---|---|
| $V$ | aggregate value of corporate equities $(= \sum_i v_{it} s_{it})$ |
| $\tau_{\text{dist}}$ | tax rate on corporate distributions |
| $\tau_{\text{corp}}$ | tax rate on corporate income |
| $\tau_{T,\text{subs}}$ | subsidy for tangible investments |
| $\tau_{I,\text{subs}}$ | subsidy for intangible investments |
| $k_T$ | tangible corporate capital stock |
| $k_I$ | intangible corporate capital stock |

# Distribution Tax Relevance for $V$

$$V_t = (1 - \tau_{\text{dist}}) \underbrace{[(1 - \tau_{T,\text{subs}})k_{T,t+1} + (1 - \tau_{\text{corp}} - \tau_{I,\text{subs}})k_{I,t+1}]}_{\text{Not directly affected by } \tau_{dist}}$$

$\Rightarrow$ If tax rate on distributions falls

- Corporate value-output ratio rises
- Capital-output ratios remain flat

# Treatment of Capital Gains

- Previous work assumed tax on accrual, not realization:

$$\tau_{\text{dist}} = 1 - \left( \frac{1 - \tau_{\text{pers}}}{1 - \tau_{\text{cg}}} \right)$$

- US taxes on realization:
  - $\tau_{\text{dist}} = \tau_{\text{pers}}$ if distribution by dividends
  - $\tau_{\text{dist}} = \tau_{\text{cg}}$ if distribution by buying back shares

# Treatment of Tax Deferral

- If tax deferral through retirement accounts allowed
- Then:

$$\tau_{\text{dist}} = 0$$

- Intuition: invest \$1
  - Give up $(1 - \tau_{\text{pers}})$ today
  - Get $(1 - \tau_{\text{pers}})(1 + i)^T$ in $T$ periods

# NIPA Profits and Corporate Capital

- If returns to tangible and intangible assets equated
- Then, on a balanced growth path:

$$\text{NIPA profit} = \frac{i}{1-\tau_{\text{corp}}} k_T + (i-g)k_I$$

- Intuition:
  - Capitalize tangibles: $(r_T - \delta_T)k_T$
  - Expense intangibles: $r_I k_I - x_I$

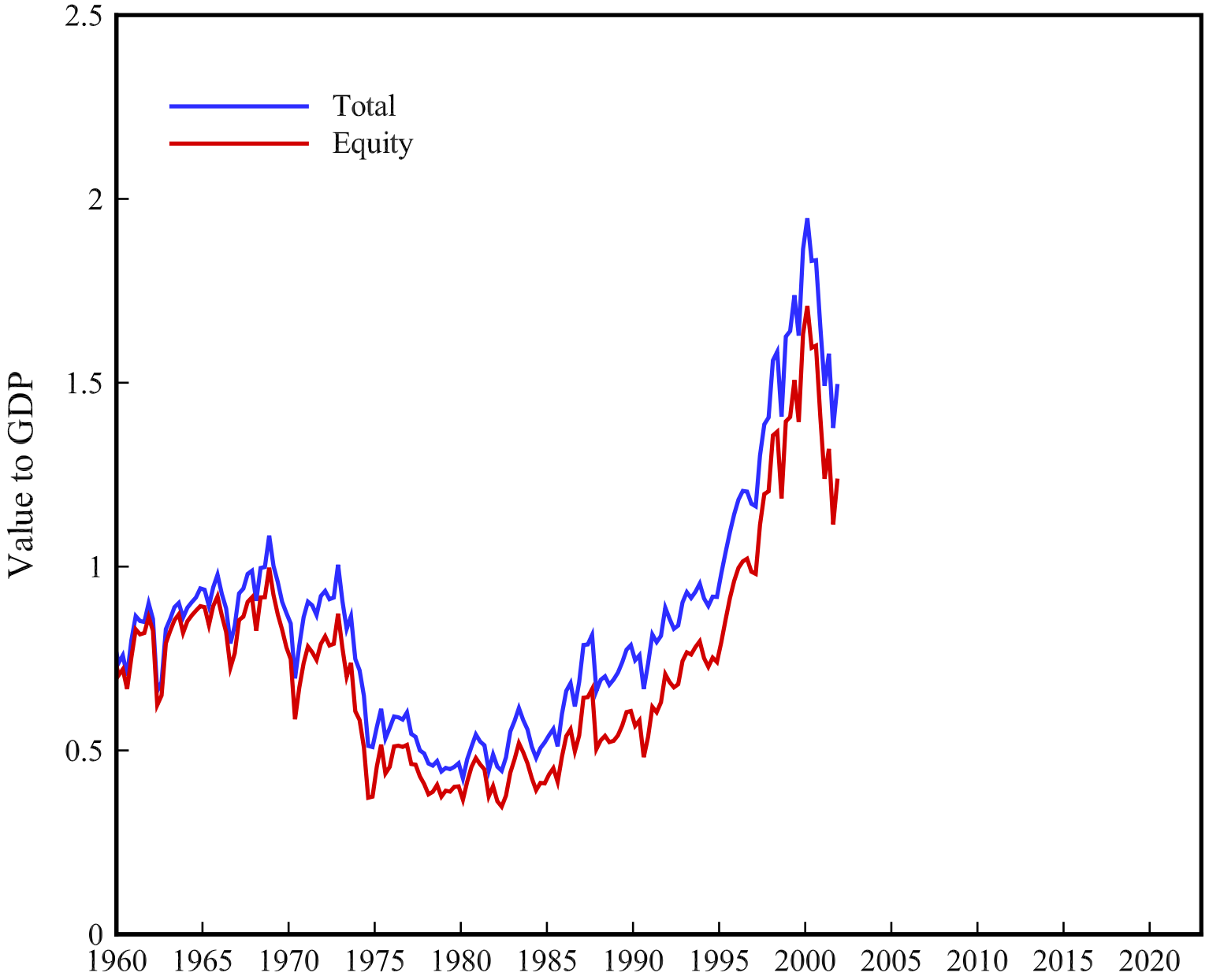
$\Rightarrow$ Estimates of $i$, $g$, $k_T$ can be used to infer $k_I$

# Rise in US Corporate Value

- Analyzed growth model with
  - NIPA data for 1960–2001
  - Profit relation to infer intangible stock
- Predicted that $V$/GDP should have roughly doubled
  - Large decline in tax on distributions
  - Large rise in outward FDI

† See McGrattan and Prescott (Restud 2005)
Taxes, Regulations, and the Value of US and UK Corporations

# Corporate Value to GDP, 1960–2001



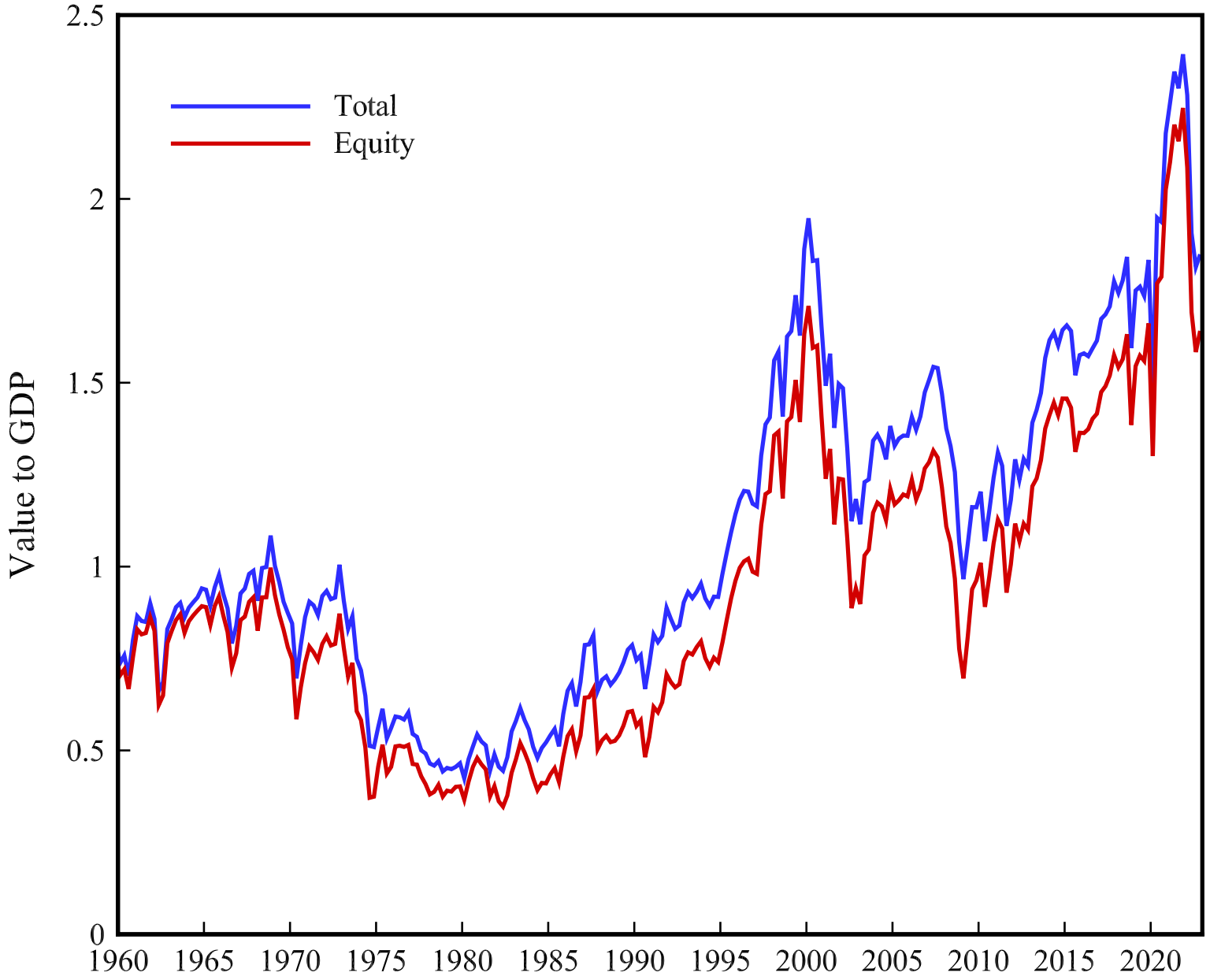
# Predicted and Actual US Corporate Values

| | 1960–69 | 1998–2001 |
|---|---|---|
| **Predicted Fundamental Values** | | |
| Domestic tangible capital | .563 | .838 |
| Domestic intangible capital | .229 | .350 |
| Foreign capital | .086 | .379 |
| Total Relative to GDP | .877 | 1.567 |
| **Actual Market Values**† | | |
| Corporate equities | .898 | 1.576 |
| Net corporate debt | .041 | .028 |
| Total Relative to GDP | .940 | 1.604 |

† Peaked in 1999 at 1.9 GDP

# What are we seeing now?

# C-Corporate Valuations



# Updates

# Updates

- Theory:
  - Incorporate nonrival intangibles of multinationals
  - Distinguish S- and C-corporations
- Data:
  - Booms and busts (eg, 2001,2008,2020,2021)
  - Tax reforms (eg, JGTRRA03, NIIT13, TCJA17)
  - Intellectual property products (IPP) introduced in 2013

# Treatment of Nonrival Intangible Assets

- If some intangibles used at home and abroad
- Then:

$$V_t^{\text{US}} = (1 - \tau_{\text{dist}}) \left[ \sum_i V_{it}^{\text{US}} + (1 - \tau_{\text{corp}}) M_{t+1}^{\text{US}} \right]$$

  where
  - $V_{it}^{\text{US}}$ are values of location-specific assets (as above)
  - $M_{t+1}^{US}$ is nonrival US R&D, brands, etc.

# Treatment of S- versus C-corp Activity

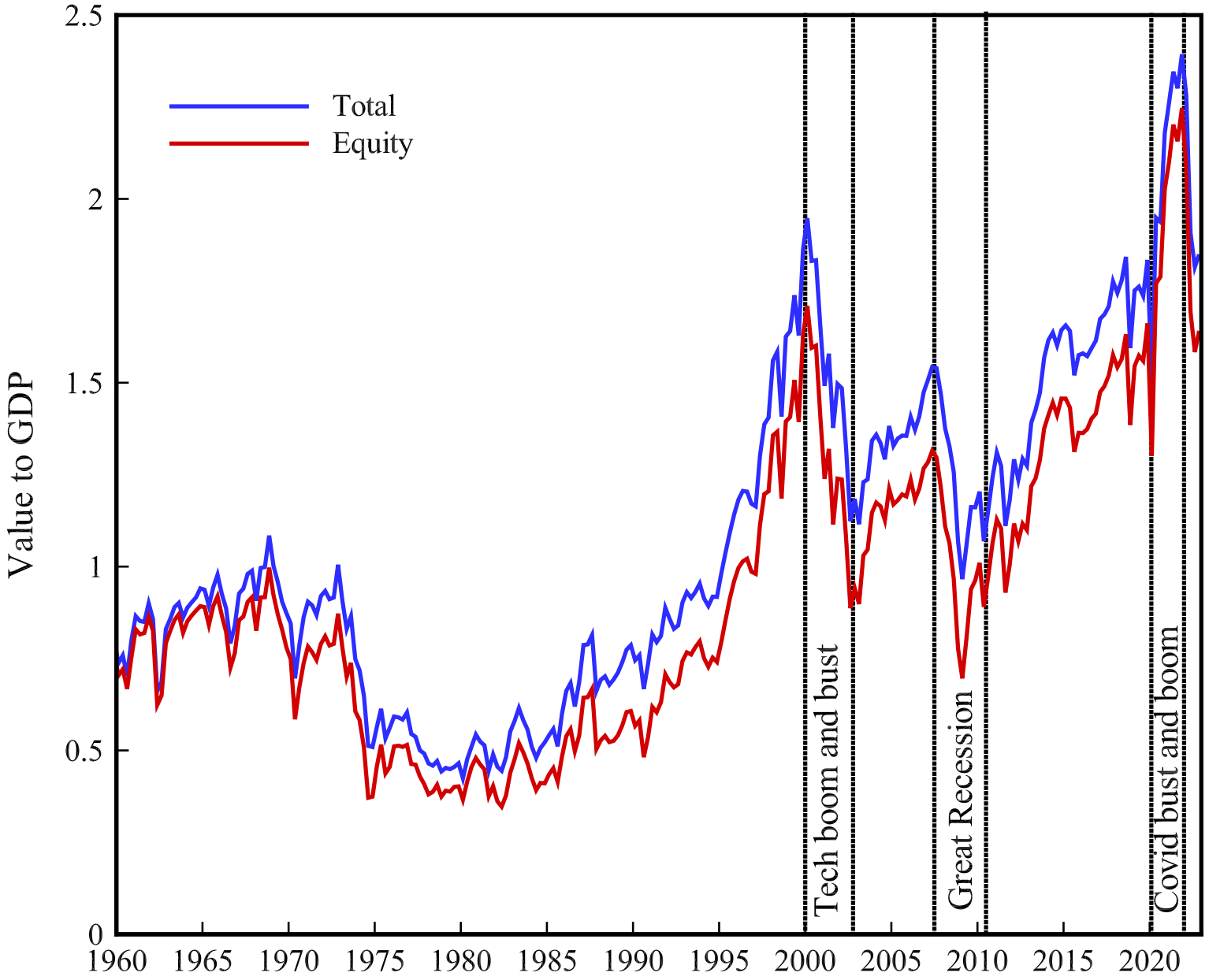
- S corporations are *pass-through* entities
- If there are no investment subsidies, then
  - S-corp profits, dividends, values:

$$\pi_{st} = d_{st} = p_{st}y_{st} - w_t n_{st} - \delta_T k_{T,st} - x_{I,st}$$
$$V_{st} = k_{T,s,t+1} + (1 - \tau_{\text{dist}})k_{I,c,t+1}$$

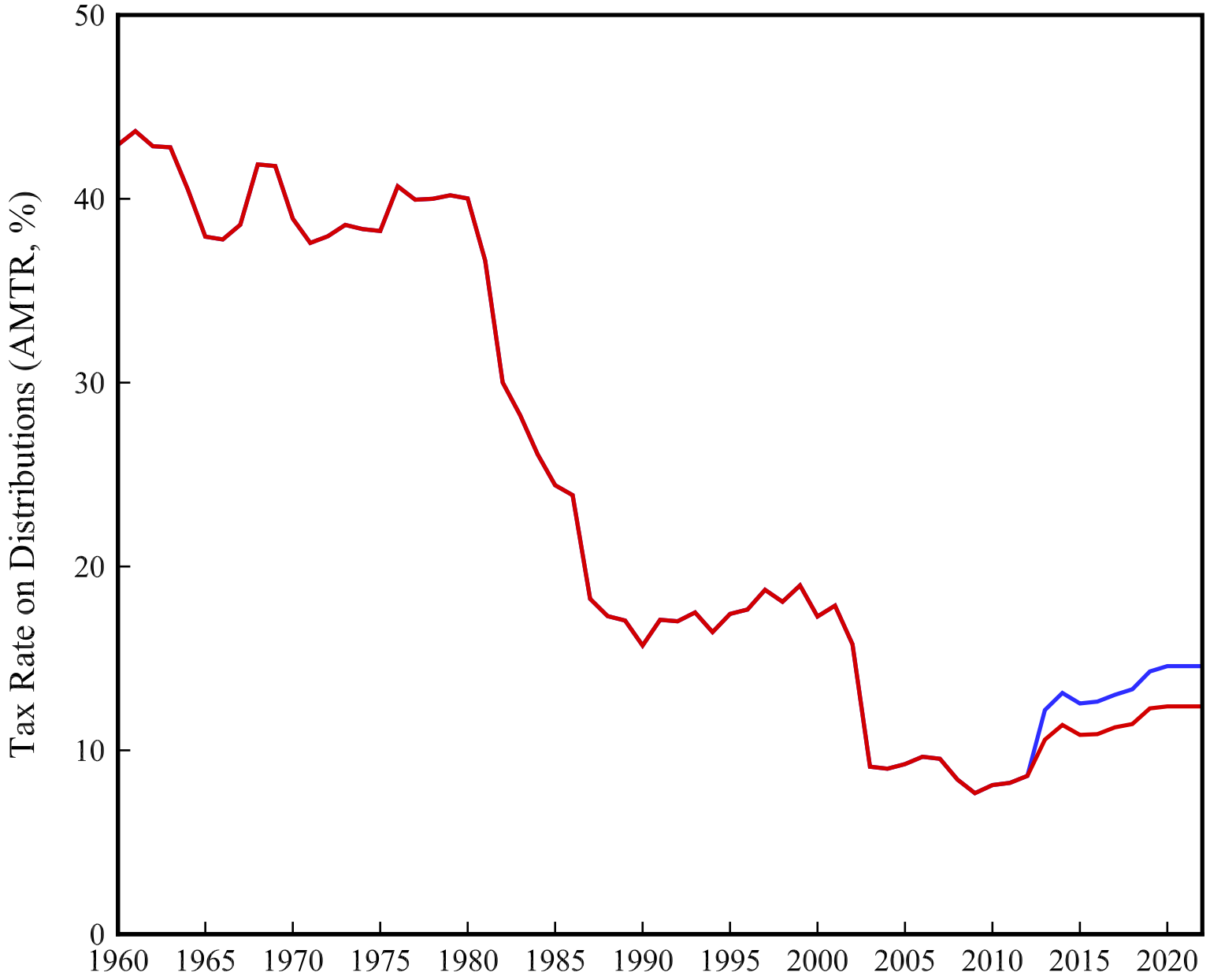
  - C-corp profits, dividends, values:

$$\pi_{ct} = p_{ct}y_{ct} - w_t n_{ct} - \delta_T k_{T,ct} - x_{I,ct}$$
$$d_{ct} = (1 - \tau_{\text{corp}})\pi_{ct} - k_{T,c,t+1} + k_{T,ct}$$
$$V_{ct} = (1 - \tau_{\text{dist}})\{k_{T,c,t+1} + (1 - \tau_{\text{corp}})k_{I,c,t+1}\}$$

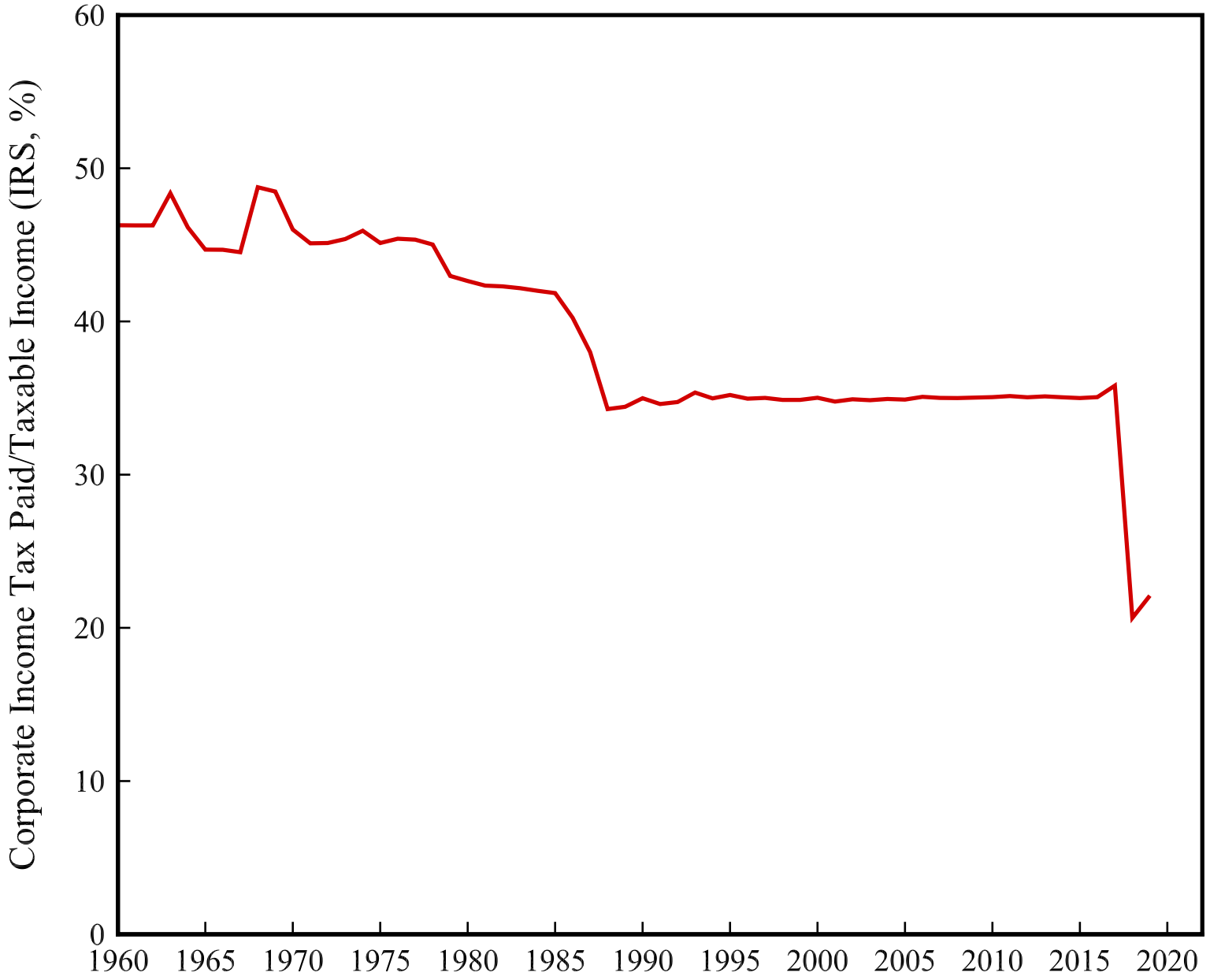
# C-Corporate Valuations: Booms and Busts



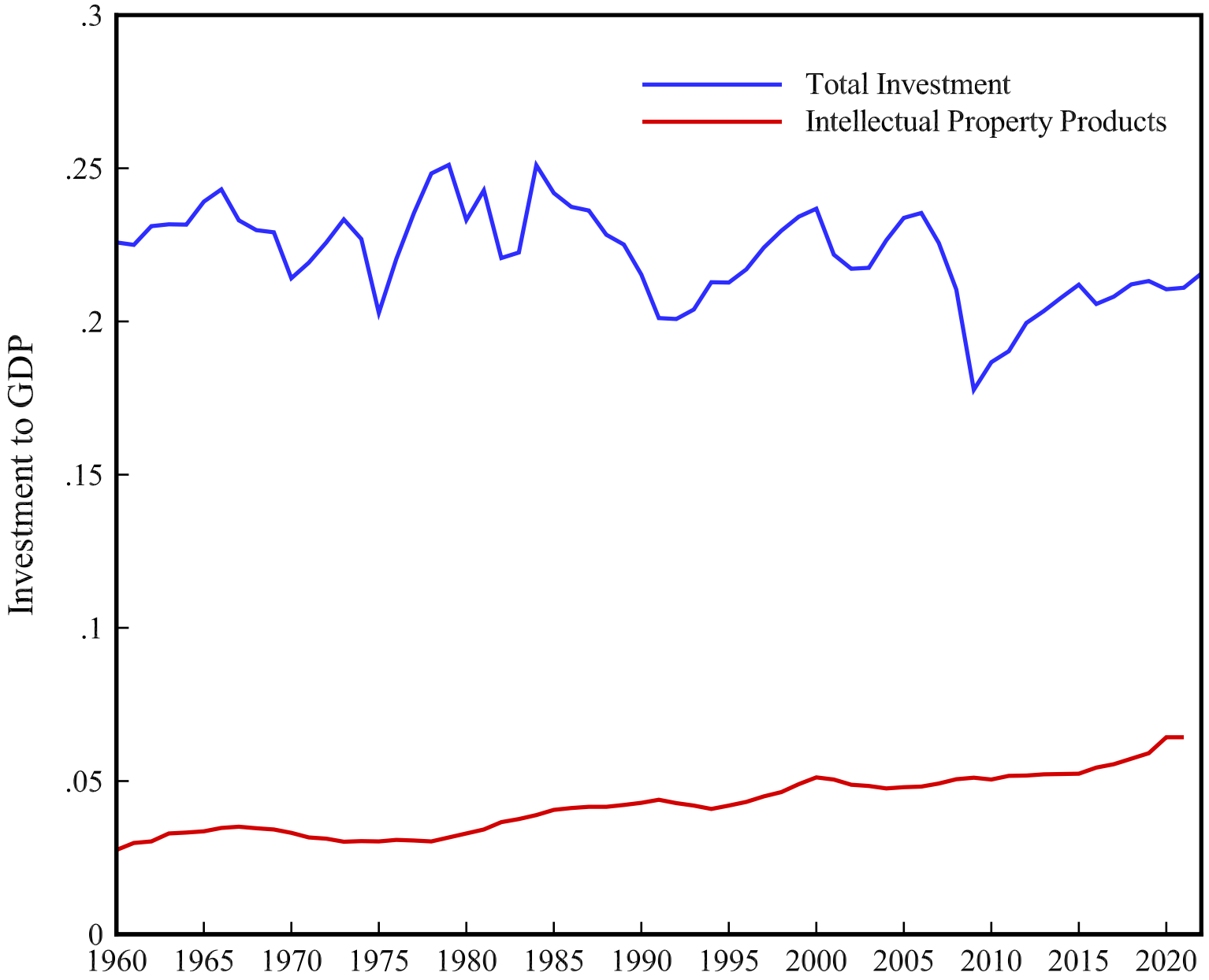
# Tax Reforms: Distributions



# Tax Reforms: Corporate income



# New BEA Investment Category

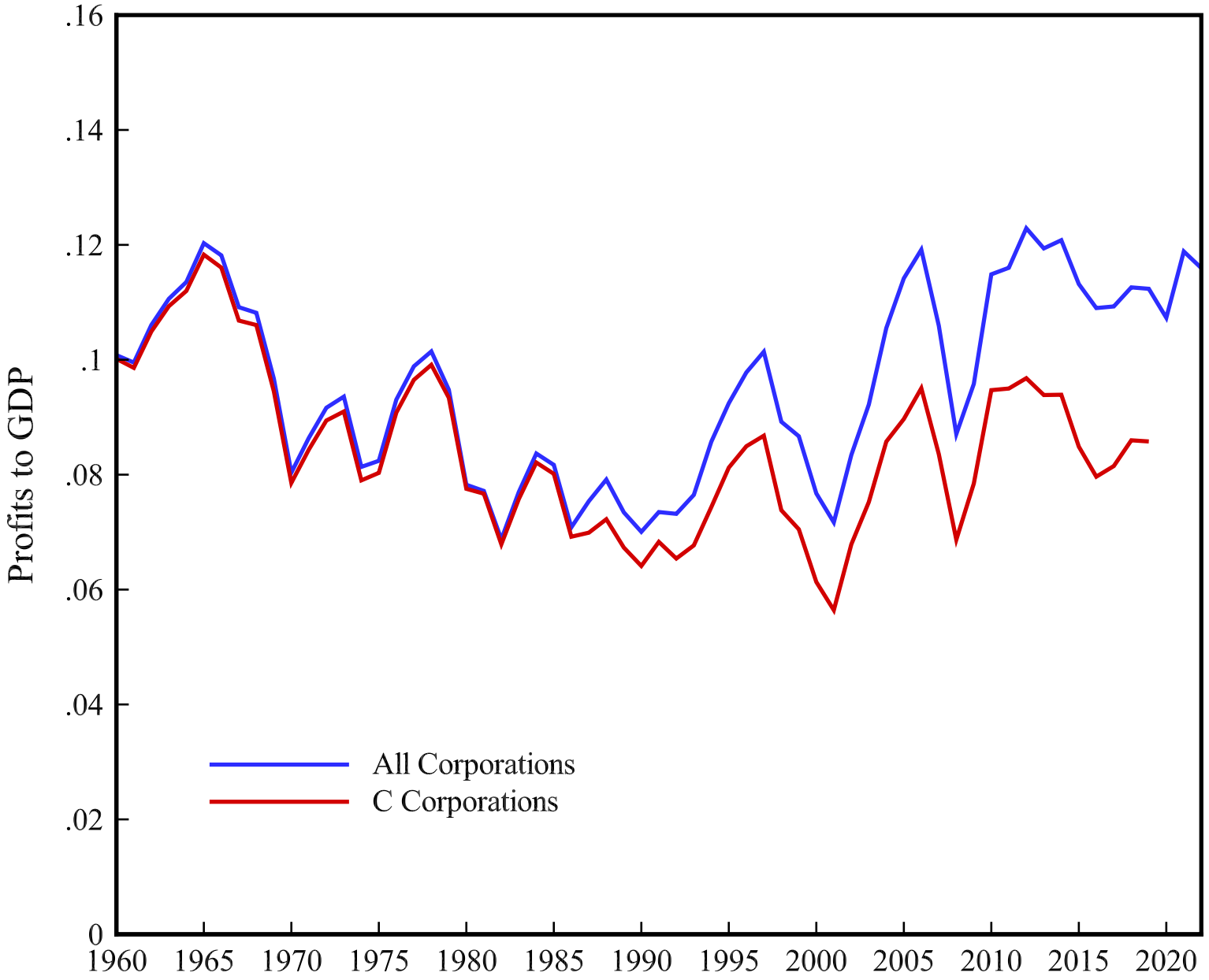


# How Does the Analysis Change?

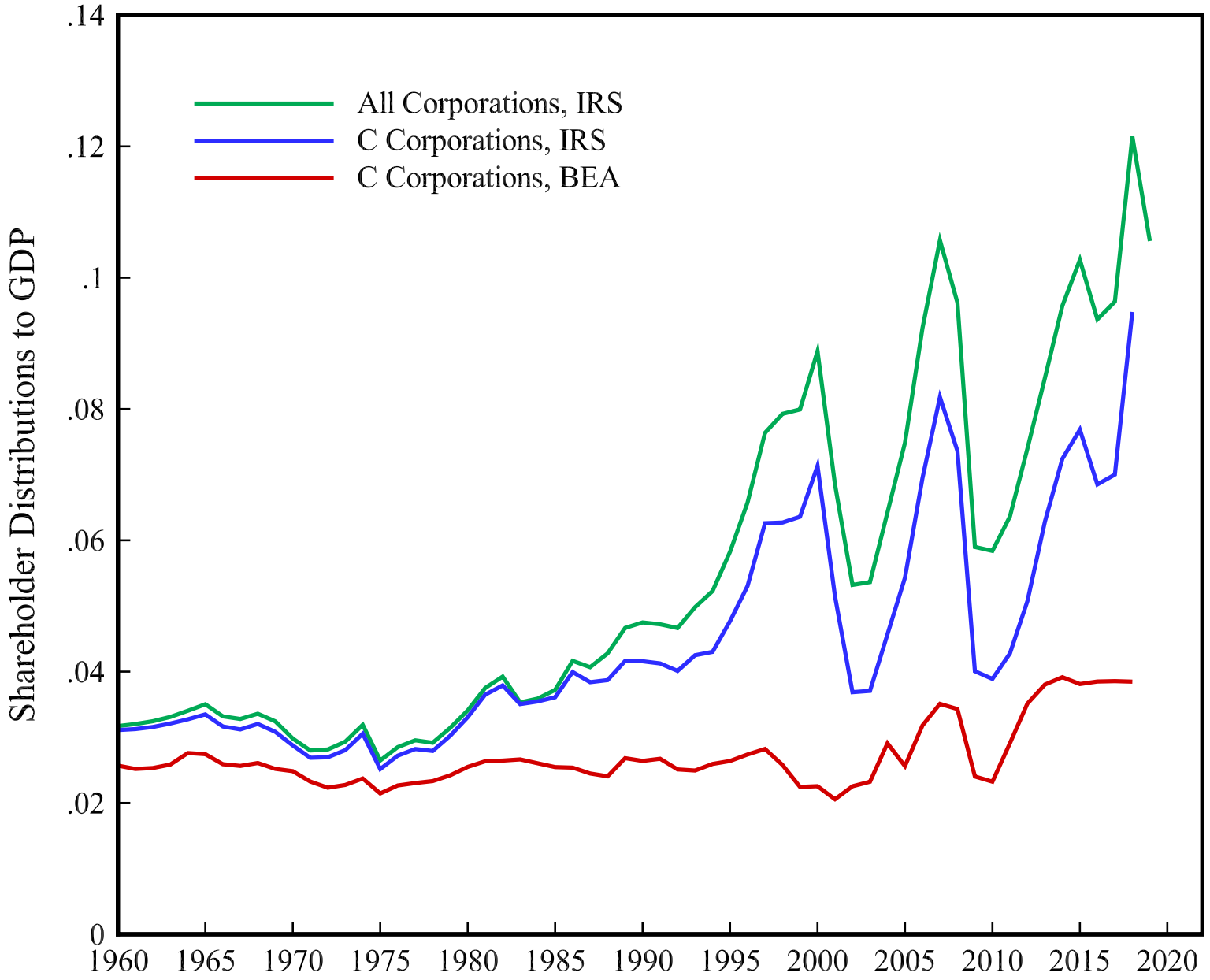
# Changes in Analysis

- Profits
  - Use national profits
  - Subtract S-corporate profits
- Distributions
  - Subtract S-corporate distributions
  - Align data with BEA definitions
- Capital stocks and investment
  - Use C-corporate structures and equipment for tangibles
  - Infer total intangible capital measure as before

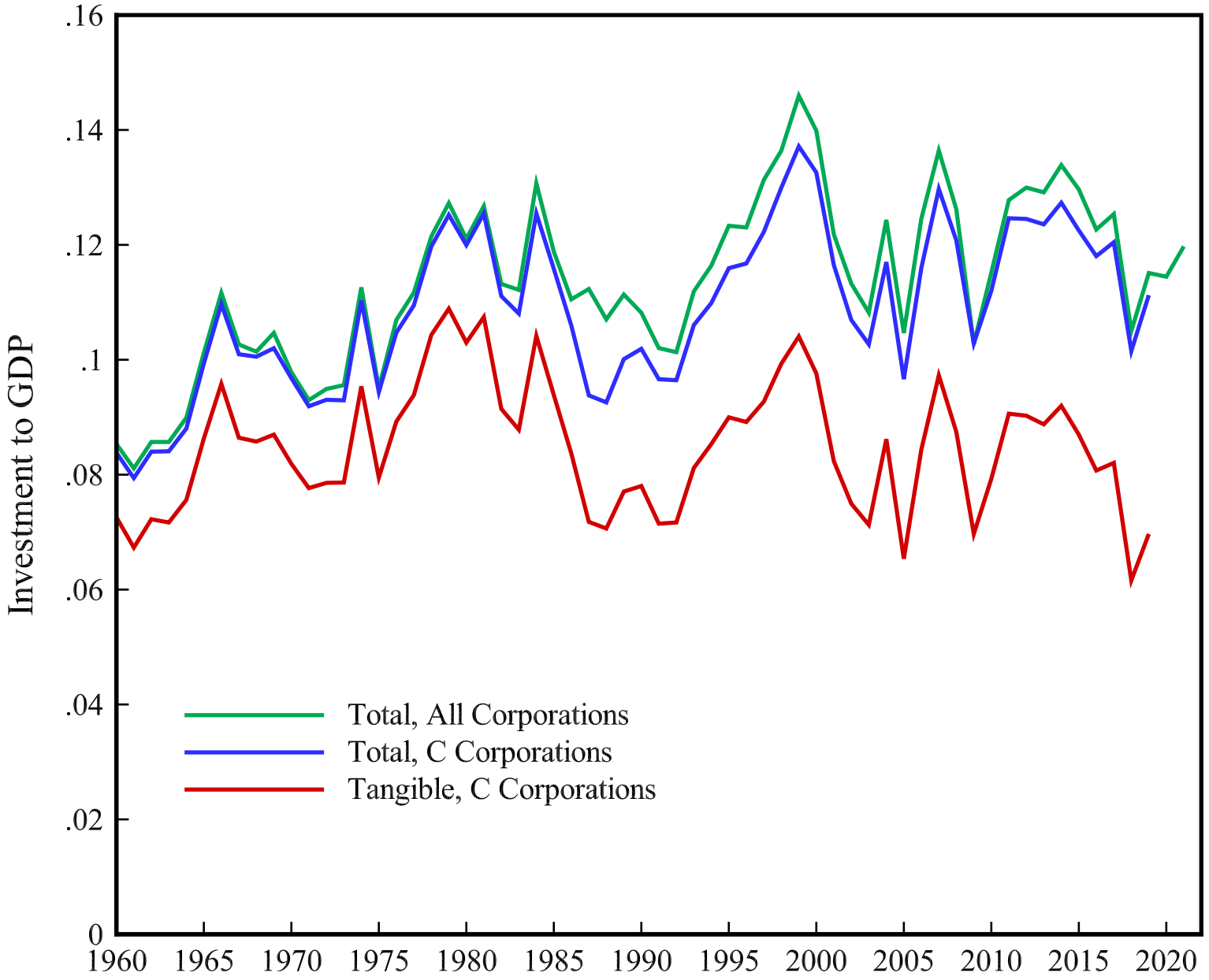
# Corporate Profits to GDP, 1960–2022



# Corporate Distributions to GDP, 1960–2019



# Corporate Investment to GDP, 1960–2021



# Results

# Re-estimating Intangible Contributions, 2000–2019

- Assume:
  - Real GDP growth of 3%
  - Discount factor of 0.98
  - Average tangible capital of 1.22 times GDP
- What are the implied intangible contributions to $\pi, V$?

# Estimated Intangible Contributions

| | Corporate Income Tax Rate (%) | | | |
|---|---|---|---|---|
| Shares | 35 | 30 | 25 | 21 |
| In NIPA profits | | | | |
| Intangible capital | 8 | 14 | 20 | 24 |
| Tangible capital | 92 | 86 | 80 | 76 |
| In market values | | | | |
| Intangible value | 24 | 39 | 48 | 54 |
| Tangible value | 76 | 61 | 52 | 46 |

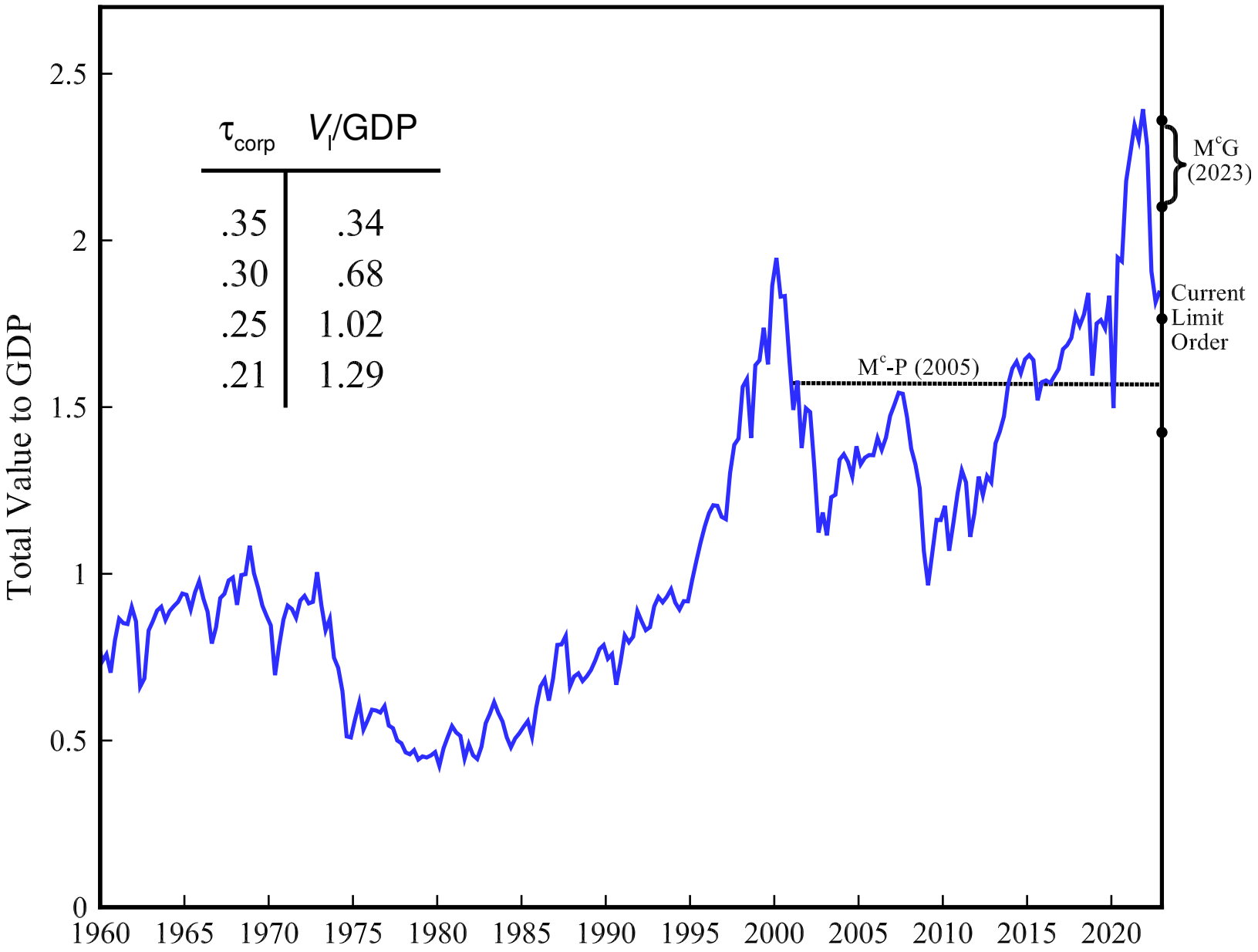
# Estimated Intangible Contributions

| | Corporate Income Tax Rate (%) | | | |
|---|---|---|---|---|
| Shares | 35 | 30 | 25 | 21 |
| In NIPA profits | | | | |
| Intangible capital | 8 | 14 | 20 | 24 |
| Tangible capital | 92 | 86 | 80 | 76 |
| In market values | | | | |
| Intangible value | 24 | 39 | 48 | 54 |
| Tangible value | 76 | 61 | 52 | 46 |

What does this imply for the bottom line?

# Bottom Line: A Visual Summary

# C-Corporate Total Value



# Was the Stock Market Overvalued in 2000-2019?

- Reasons for answering no:
  - Investments were steady through 2001-02 & 2008-09
  - Distributions were steady through 2001-02 & 2008-09
  - Taxes on distributions were low
  - Outward FDI continued rising

$\Rightarrow$ Mostly undervalued relative to theory

# Is the Stock Market Overvalued in 2023?

- Reasons for answering no:
  - Large decline in corporate tax rate, $\tau_{\text{corp}}$
  - Multinationals have had time to figure out TCJA
  - Taxes on distributions have remained low
  - Outward FDI still rising

$\Rightarrow$ Revising current estimate upward based on theory