



Not everything that counts can be counted, and
not everything that can be counted counts.

— ALBERT EINSTEIN



INTANGIBLE CAPITAL AND MACROECONOMIC MODELING

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[www.minneapolisfed.org/research /economists/emcgrattan.html](http://www.minneapolisfed.org/research/economists/emcgrattan.html)



OVERVIEW

- Central Bank policymakers need to know
 - What drives fluctuations and changes in trends
 - What is the best policy response
- National Accounts are crucial element in analysis
- But ... not everything that counts can be counted



INTANGIBLE CAPITAL

- Can't entirely (or easily) be counted
- But, it is important when accounting for
 - Corporate equity levels relative to GDP (always!)
 - Boom in the U.S. economy in the 1990s
 - Collapse of the U.S. net asset position in the 2000s



THREE WAYS TO MEASURE INTANGIBLE CAPITAL

- Residually: $V - qK$
- Directly with estimates of:
 - Expenditures (R&D+ads+organization capital)
 - Depreciation rates
- Indirectly with estimates of:
 - Tangible capital stocks
 - NIPA profits = tangible rents + intangible rents
– intangible expenses



INTANGIBLE CAPITAL AND THE STOCK MARKET



INTANGIBLE CAPITAL AND THE STOCK MARKET

- Corporate value = present value of discounted distributions
= value of productive capital

$$V_t = \sum_i \left\{ \underbrace{q_{T,i,t} K_{T,i,t+1}}_{\text{Tangible}} + \underbrace{q_{I,i,t} K_{I,i,t+1}}_{\text{Plant-specific}} \right\} + \underbrace{q_{M,t} K_{M,t+1}}_{\text{Global}}$$

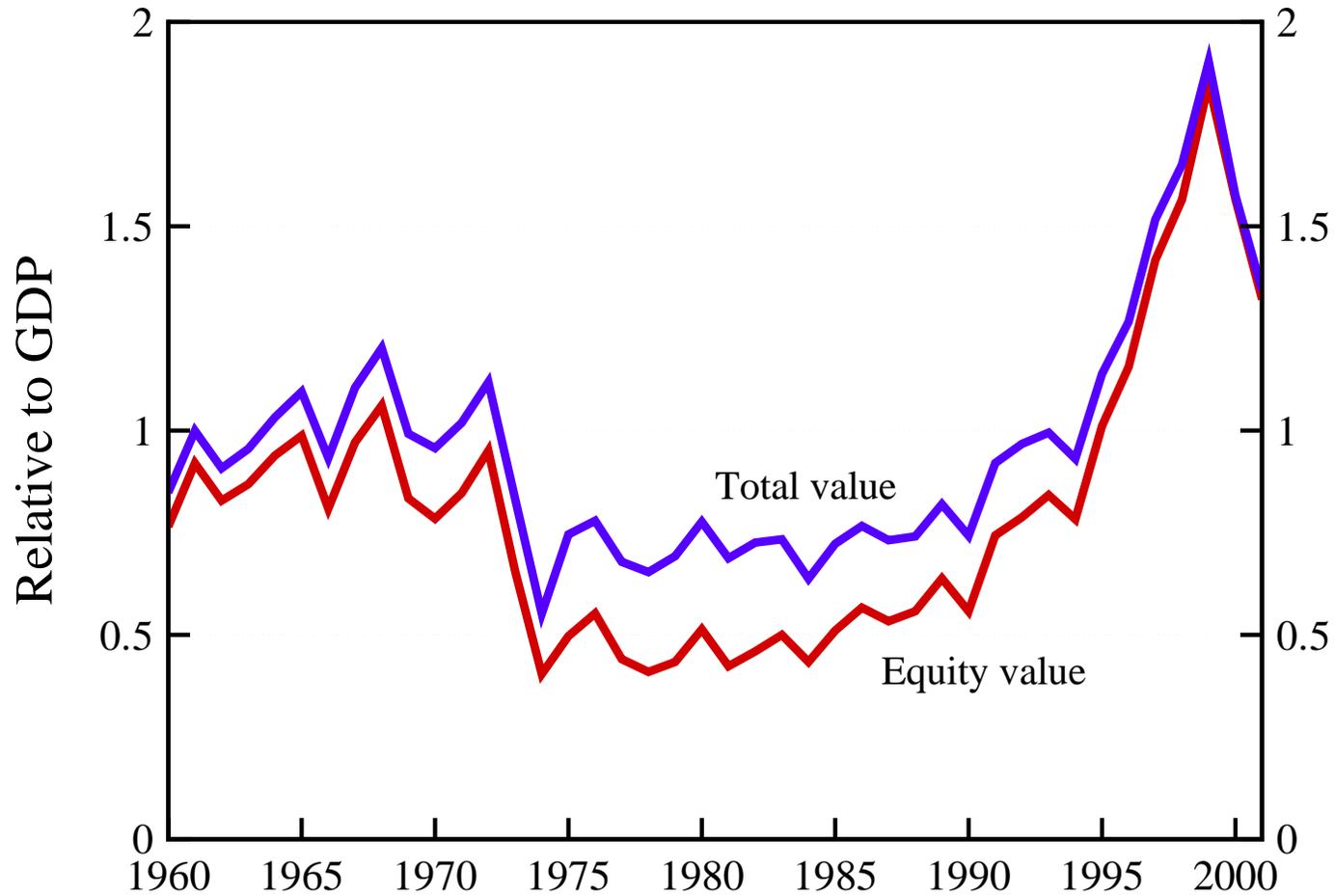
Intangible

where i indexes countries

- With only domestic tangible capital, theory fails miserably!



Value of US Corporations, 1960-2001



Value/GDP varies a lot, but $K_{T,us}/GDP \approx 1$



TAXES—AFFECTING q 'S—AND INTANGIBLES IMPORTANT

	1960-69	1998-01
PREDICTED FUNDAMENTAL VALUES		
Domestic tangible capital	.56	.84
Domestic intangible capital	.23	.35
Foreign capital	<u>.09</u>	<u>.38</u>
TOTAL RELATIVE TO GDP	.88	1.57
PRICE-EARNINGS RATIO	13.5	27.5
ACTUAL VALUES		
Corporate equities	.90	1.58
Net corporate debt	<u>.04</u>	<u>.03</u>
TOTAL RELATIVE TO GDP	.94	1.60
PRICE-EARNINGS RATIO	14.5	28.1



INTANGIBLE CAPITAL AND THE PUZZLING 1990s BOOM



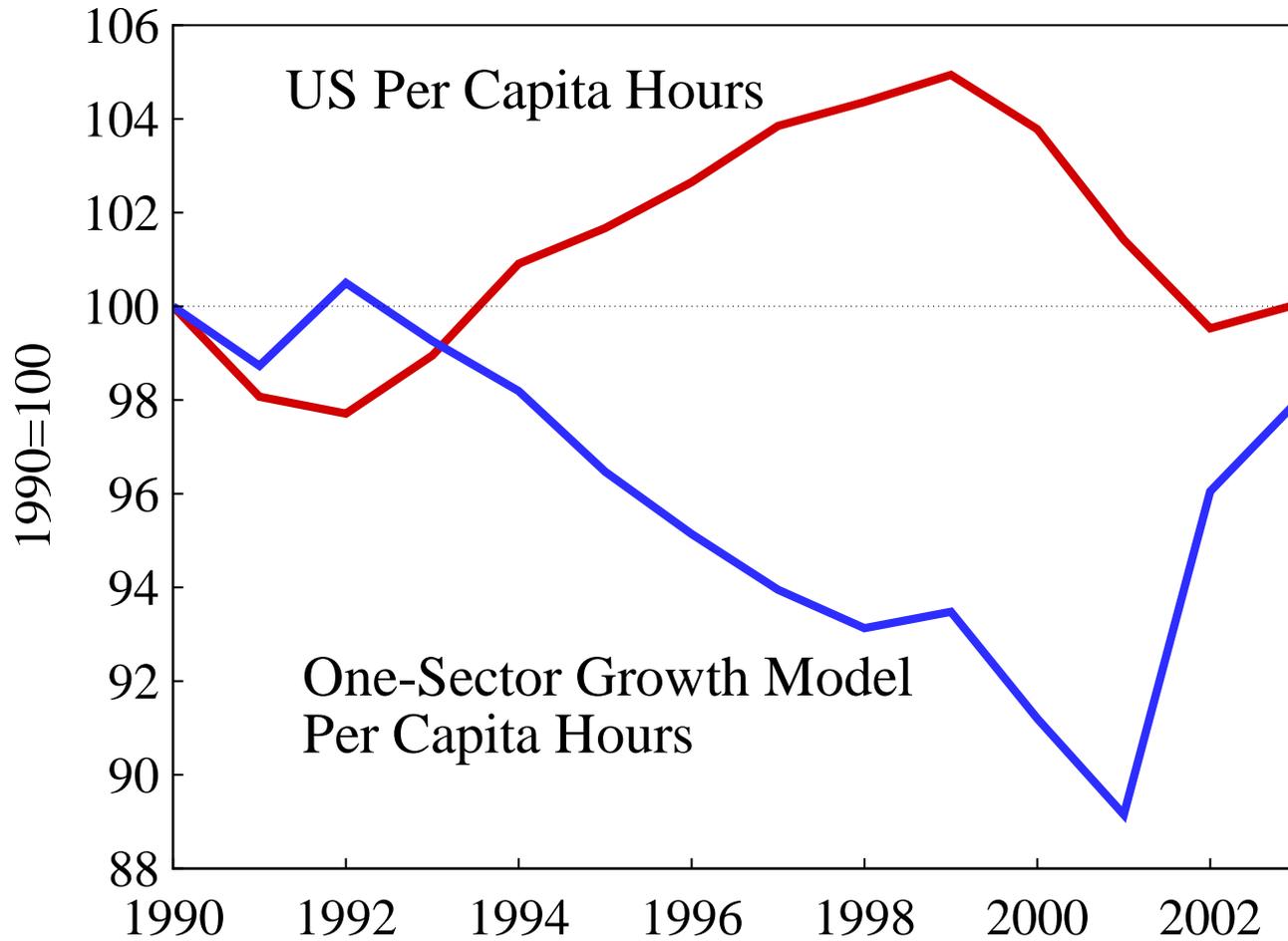
THE PUZZLING 1990S BOOM

- Aggregate TFP and GDP/hour were low relative to trend
- Labor taxes were rising

⇒ Standard theory predicts a depressed economy

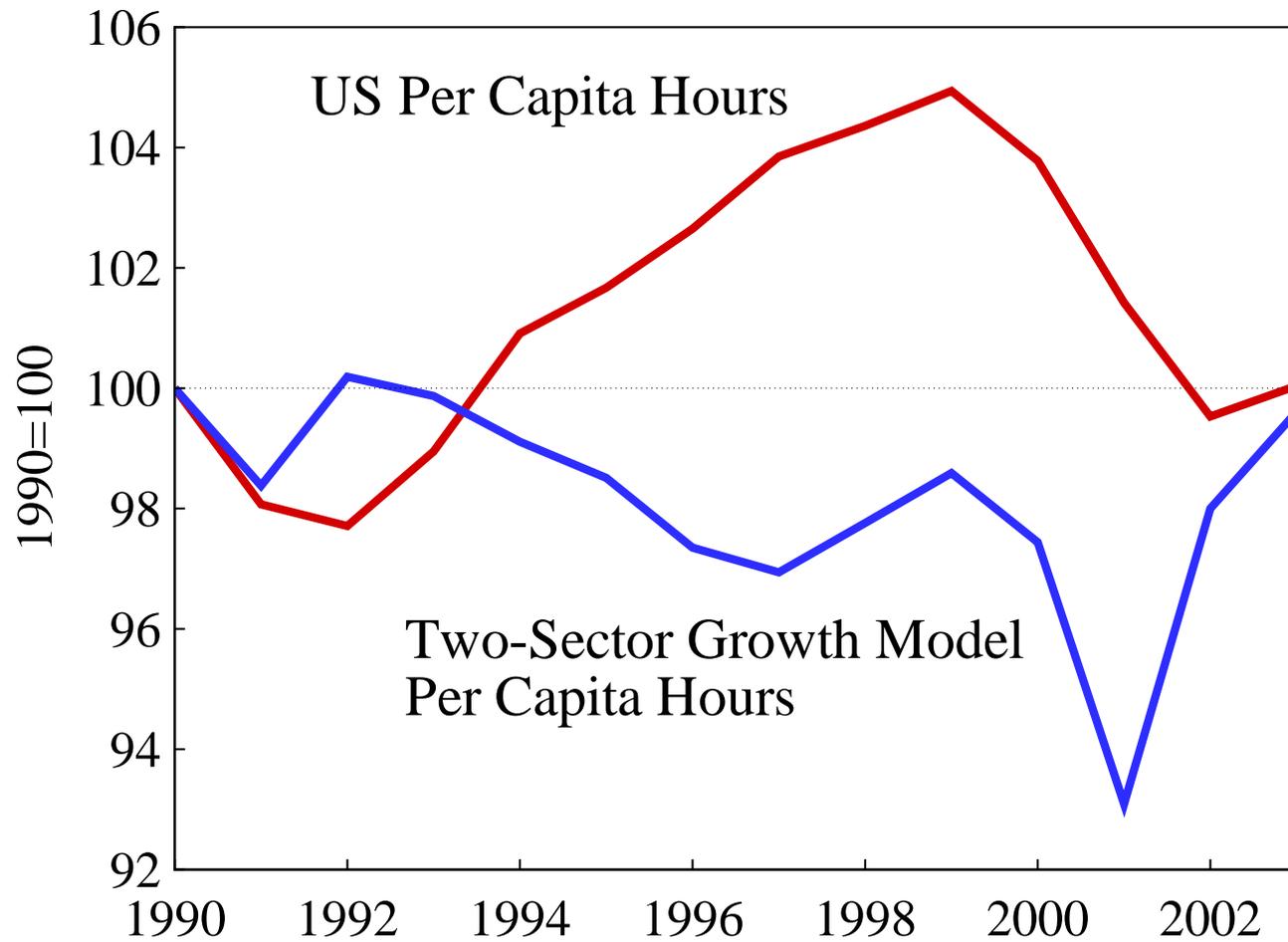


THEORY PREDICTS A DEPRESSED ECONOMY





THEORY PREDICTS A DEPRESSED ECONOMY





WHY WAS THE ECONOMY BOOMING?

- Two key factors:
 - Intangible capital that is expensed
 - Nonneutral technology change w.r.t. its production
- Idea: model tech boom as boom in intangible production



WHY WAS THE ECONOMY BOOMING?

- Two key factors:
 - Intangible capital that is expensed
 - Nonneutral technology change w.r.t. its production
- ⇒ Increased hours in intangible production



WHY WAS THE ECONOMY BOOMING?

- Two key factors:
 - Intangible capital that is expensed
 - Nonneutral technology change w.r.t. its production
- ⇒ Increased intangible investment



WHY WAS THE ECONOMY BOOMING?

- Two key factors:
 - Intangible capital that is expensed
 - Nonneutral technology change w.r.t. its production
- ⇒ Understated growth in *measured* productivity



INTUITION

- True compensation per hour

$$w_t \propto \frac{y_t + q_t x_{It}}{h_{yt} + h_{xt}}$$

$$\neq \frac{y_t}{h_{yt} + h_{xt}}$$

where

y_t = output of final goods and services

$q_t x_{It}$ = output of intangible production

h_{yt} = hours in production of y

h_{xt} = hours in production of x



BEA NATIONAL ACCOUNTS

NIPA INCOME

Capital consumption

Taxes on production

Compensation **less sweat**

Profits **less expensed**

Net interest

NIPA PRODUCT

Personal consumption

Government consumption

Government investment

Private tangible investment

Net exports



REVISED NATIONAL ACCOUNTS

TOTAL INCOME

Capital consumption
Taxes on production
Compensation **less sweat**
Profits **less expensed**
Net interest
Capital gains

TOTAL PRODUCT

Personal consumption
Government consumption
Government investment
Private tangible investment
Net exports
Intangible investment



REVISED NATIONAL ACCOUNTS

TOTAL INCOME

Capital consumption

Taxes on production

Compensation

Profits

Net interest

TOTAL PRODUCT

Personal consumption

Government consumption

Government investment

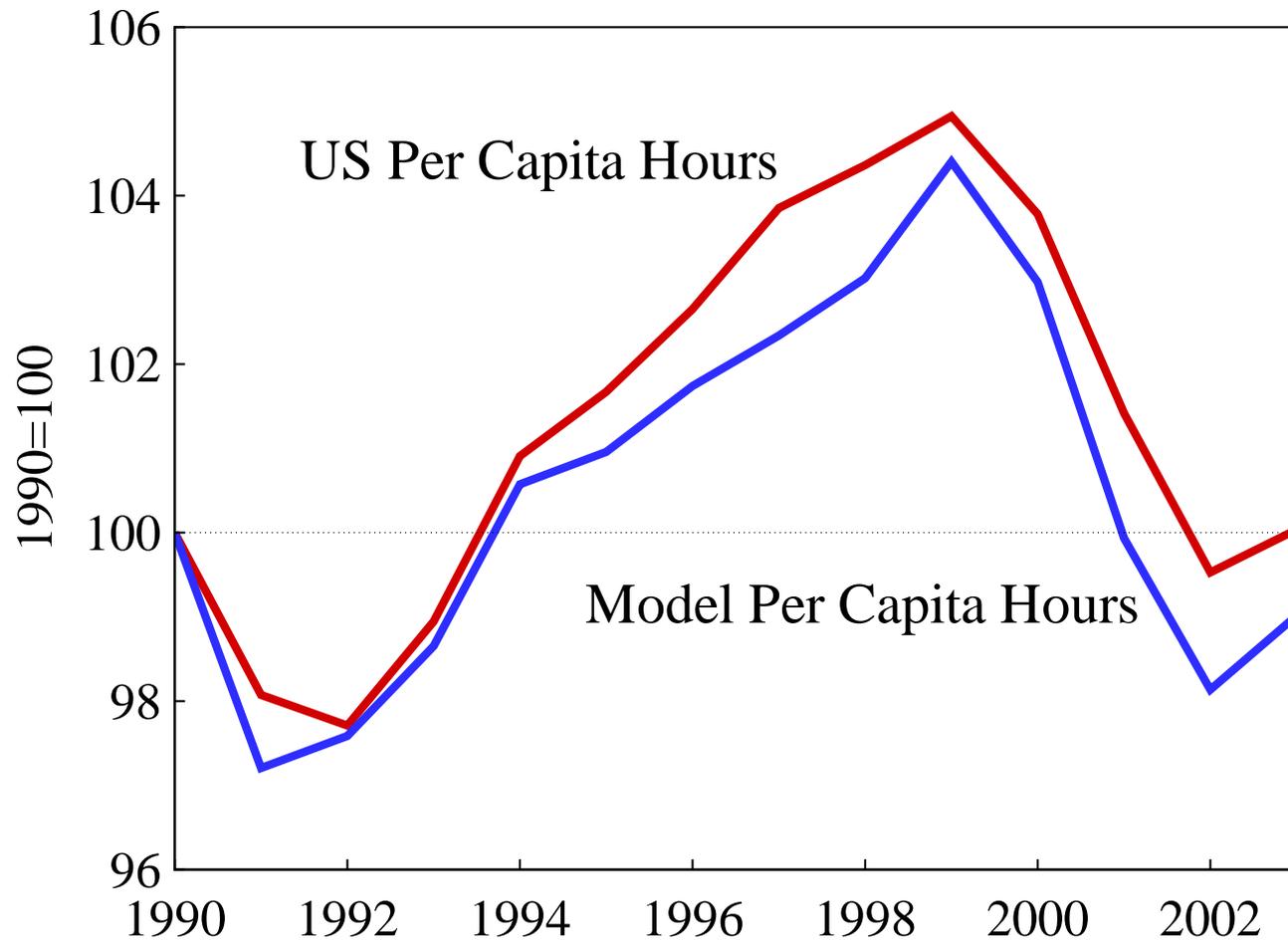
Private tangible investment

Net exports

Intangible investment

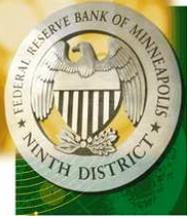


THEORY WITH INTANGIBLE CAPITAL CONSISTENT





INTANGIBLE CAPITAL AND GLOBAL “IMBALANCES”

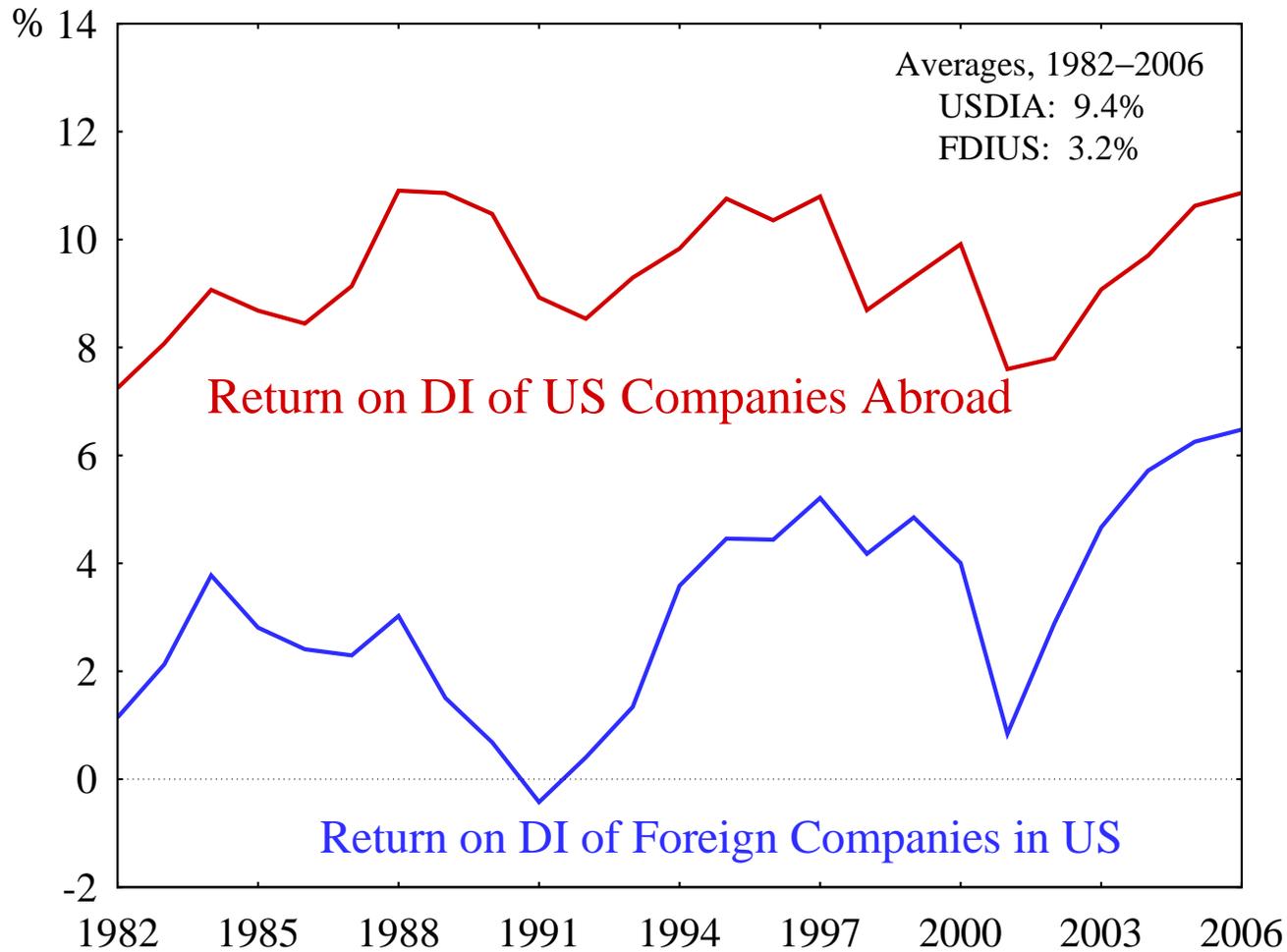


A DIRECT INVESTMENT (DI) PUZZLE

- BEA reports for 1982–2006:
 - US companies earned 9.4% average returns
 - Foreign companies earned 3.2% average returns
- on their foreign direct investment abroad



WHY IS RETURN DIFFERENTIAL LARGE AND PERSISTENT?





REPORTED FDI RETURN (r_{BEA})

- With no intangible capitals,

$$\begin{aligned} r_{BEA} &= \text{after-tax profits/tangible capital} \\ &= \text{economic return } (r) \end{aligned}$$

- With intangible capitals,

$$\begin{aligned} r_{BEA} &= (r \times \text{tangible capital} \\ &\quad + \text{rents on intangible capital} \\ &\quad - \text{intangible investments expensed abroad}) \\ &\quad / \text{tangible capital} \\ &\neq r \end{aligned}$$

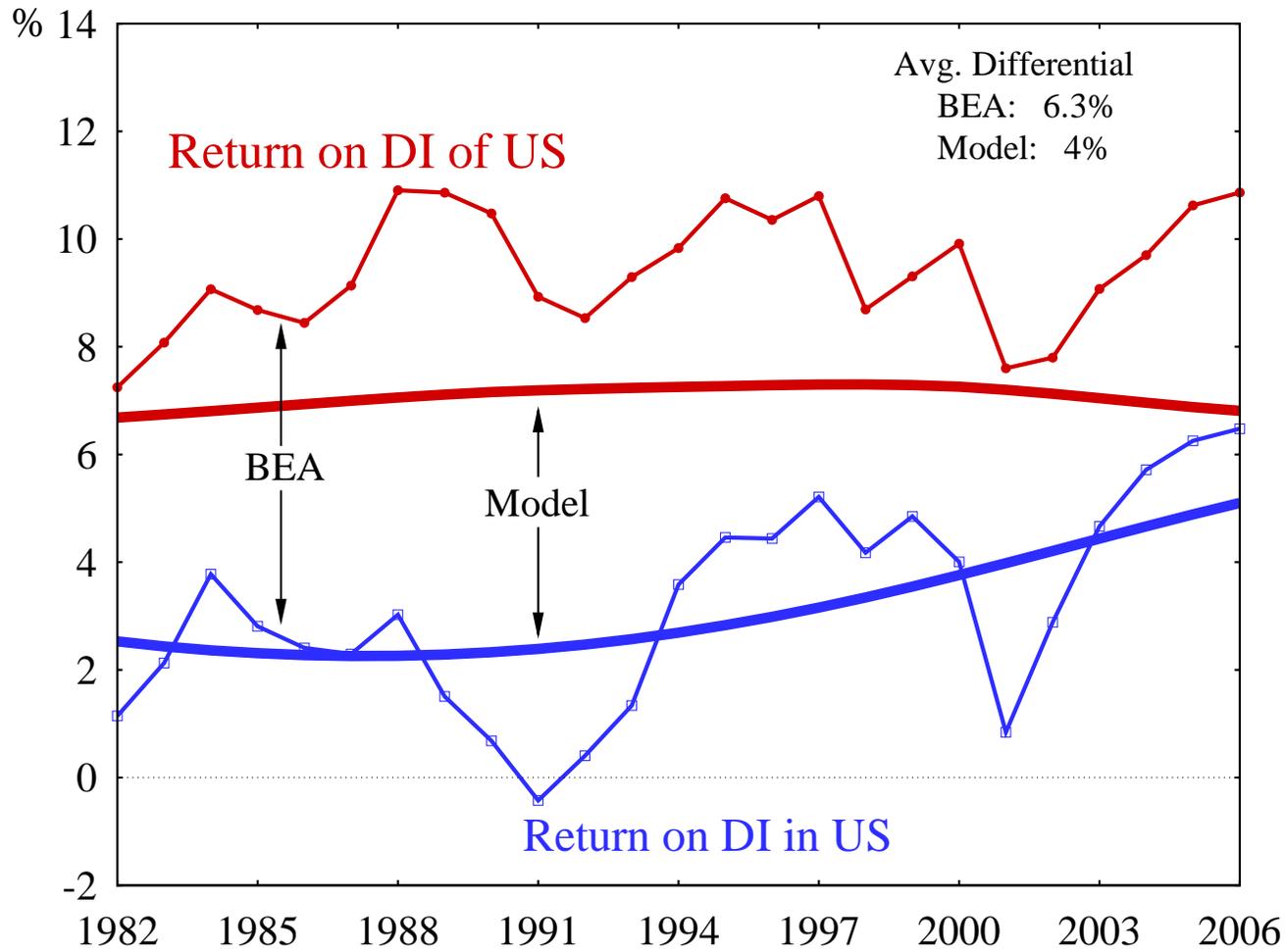


HOW MUCH OF DIFFERENCE DUE TO MEASUREMENT?

- To answer, develop a model with essential role for FDI and
 - Intangible capital that is plant-specific
 - Technology capital that is not plant-specific
- Construct model's statistics using BEA methodology



How Much of Difference Due to MEASUREMENT?





LESSONS FOR THE CENTRAL BANK

- The rise in US equity values was not “irrational exuberance”
- The 1990s boom in US was due to real, not monetary factors
- Global “imbalances” occur even when markets function well



RECOMMENDATIONS FOR NATIONAL ACCOUNTANTS

- Keep the measurement as transparent as possible
- Leave certain intangible investments in satellite accounts
- Discontinue market value direct investment position series
- Drop the concept of net asset position