



# Discussion of Benigno-Fornaro “Stagnation Traps”

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## Overview

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- How does a deep recession become a long slump?
- Feedback effects on R&D and productivity growth!
  - Recession  $\Rightarrow$  lower GDP
  - Reduces PDV of profits from innovation
  - Lowers innovation  $\Rightarrow$  lower TFP

## Neoclassical Growth Model and Capital

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- Recession  $\Rightarrow$  lower investment
  - Reduces the capital stock
  - Therefore lowers trend GDP
- Will the economy return to its original steady state?
  - **Yes:** if the recession is caused by a temporary shock
  - **No:** if a permanent rise in “user cost of capital”
- This force is partly responsible for the CBO’s downward revisions of potential GDP.

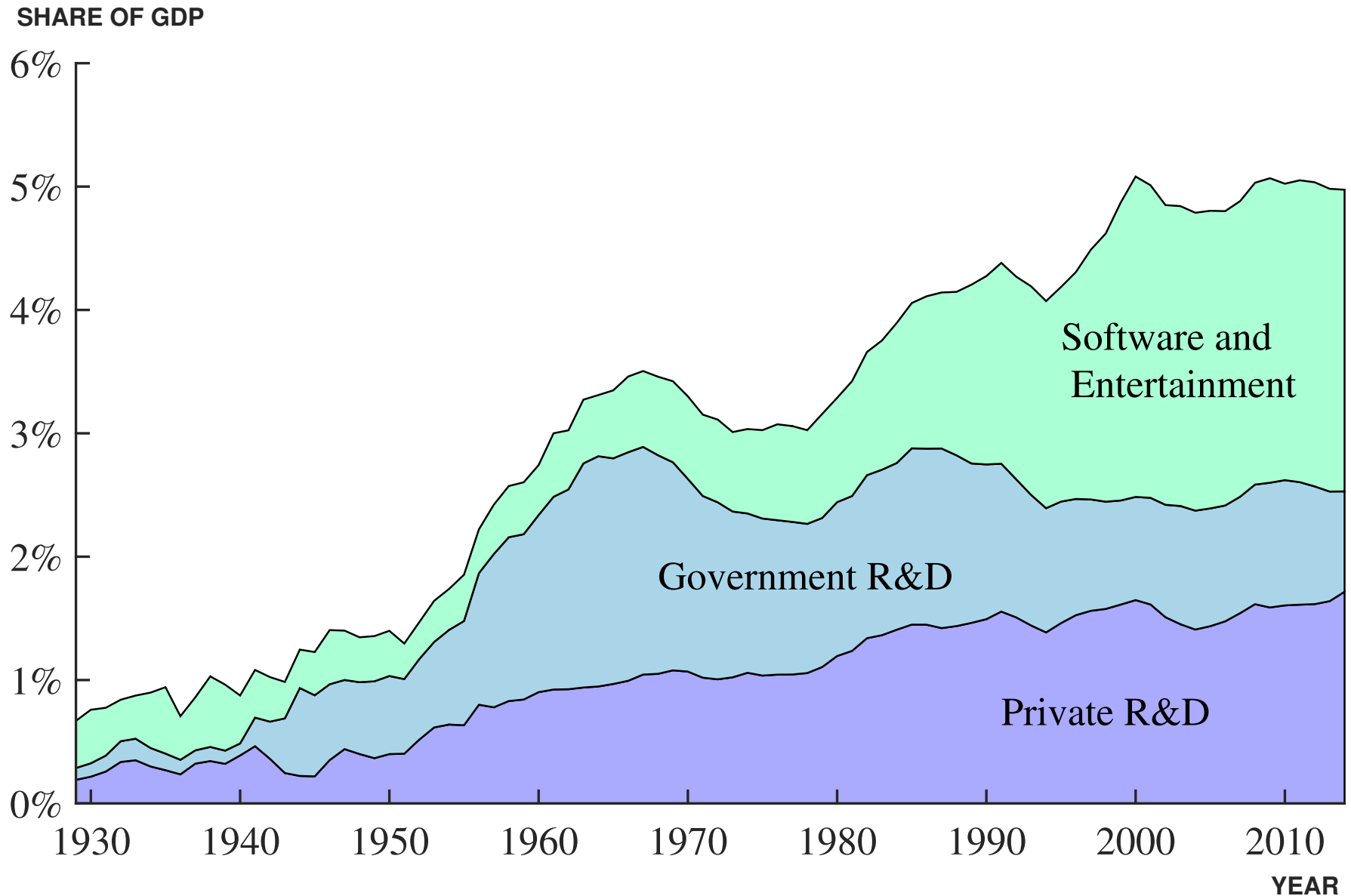
## Beyond the Neoclassical Growth Model

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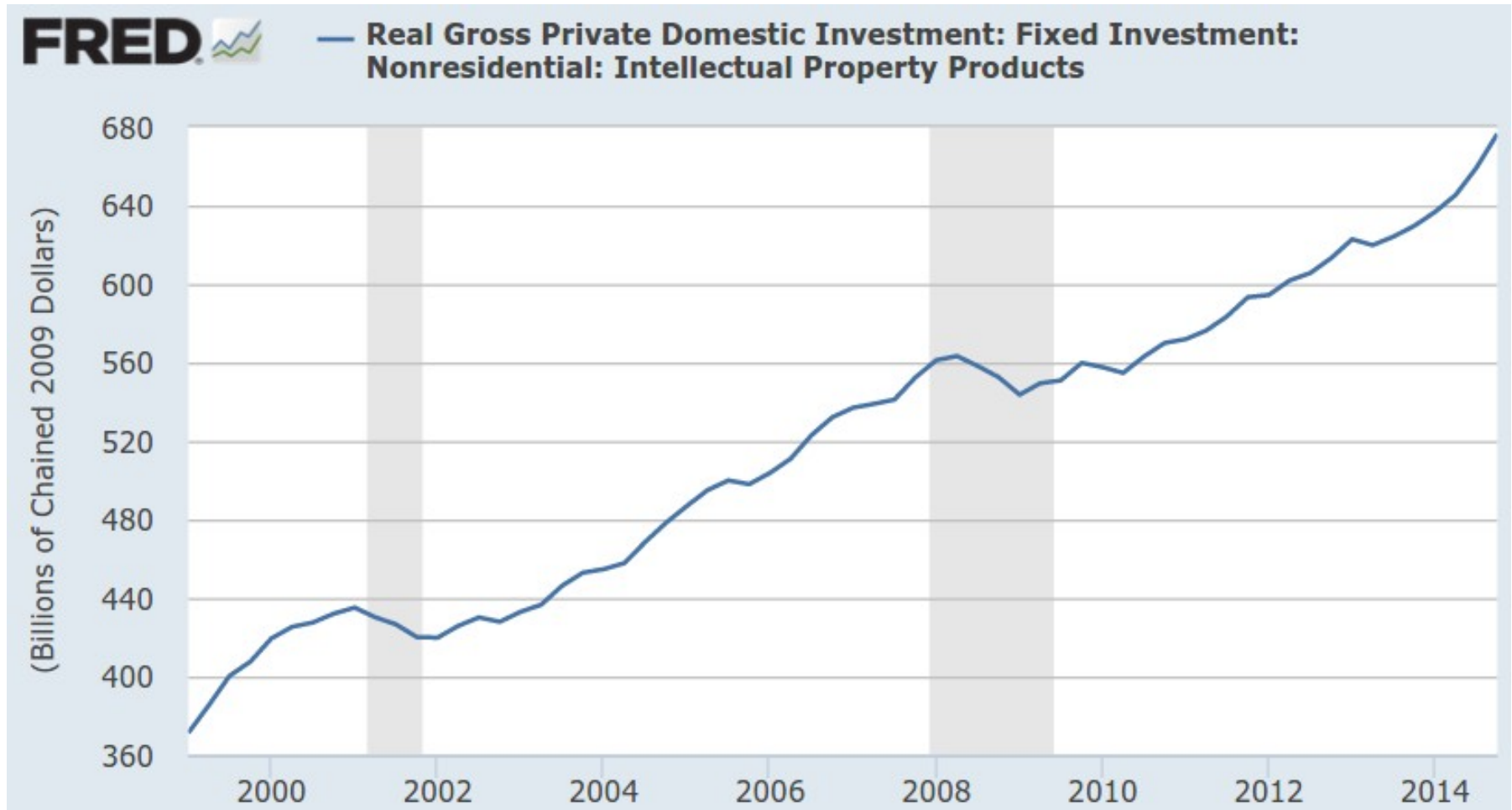
- Focus on innovation and TFP, not capital
  - Recession  $\Rightarrow$   $\downarrow$  PDV profits  $\Rightarrow$   $\downarrow$  innovation  $\Rightarrow$   $\downarrow$  TFP
  - Especially in GFC / ZLB: high  $r \Rightarrow$  discount future
- Paper explores additional features
  - Endogenous growth
  - Multiple equilibria
  - Zero lower bound issues
- Intriguing. But the heart of the issue:

To what extent has the Great Recession lowered R&D and therefore lowered TFP?

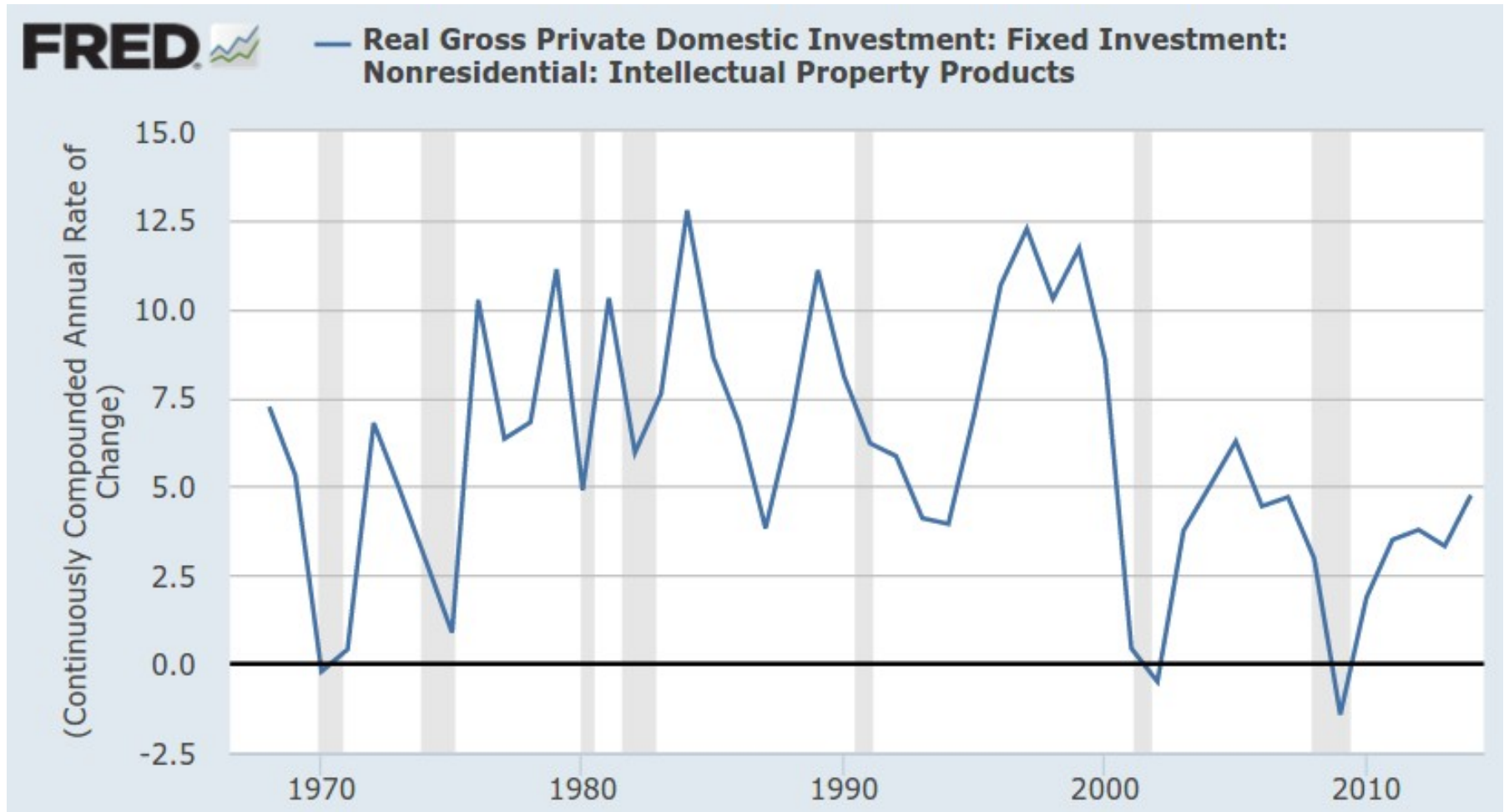
# Research during the Financial Crisis and Slump



## In chained dollars...



## In growth rates...



## Quantify effect on TFP?

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- Let  $A$  denote TFP and  $R$  denote R&D spending. Simple idea production function:

$$\frac{\Delta A_t}{A_t} = \alpha R_t A_t^{-\beta}$$

- Calibrate  $\beta$  to match the long term trends.

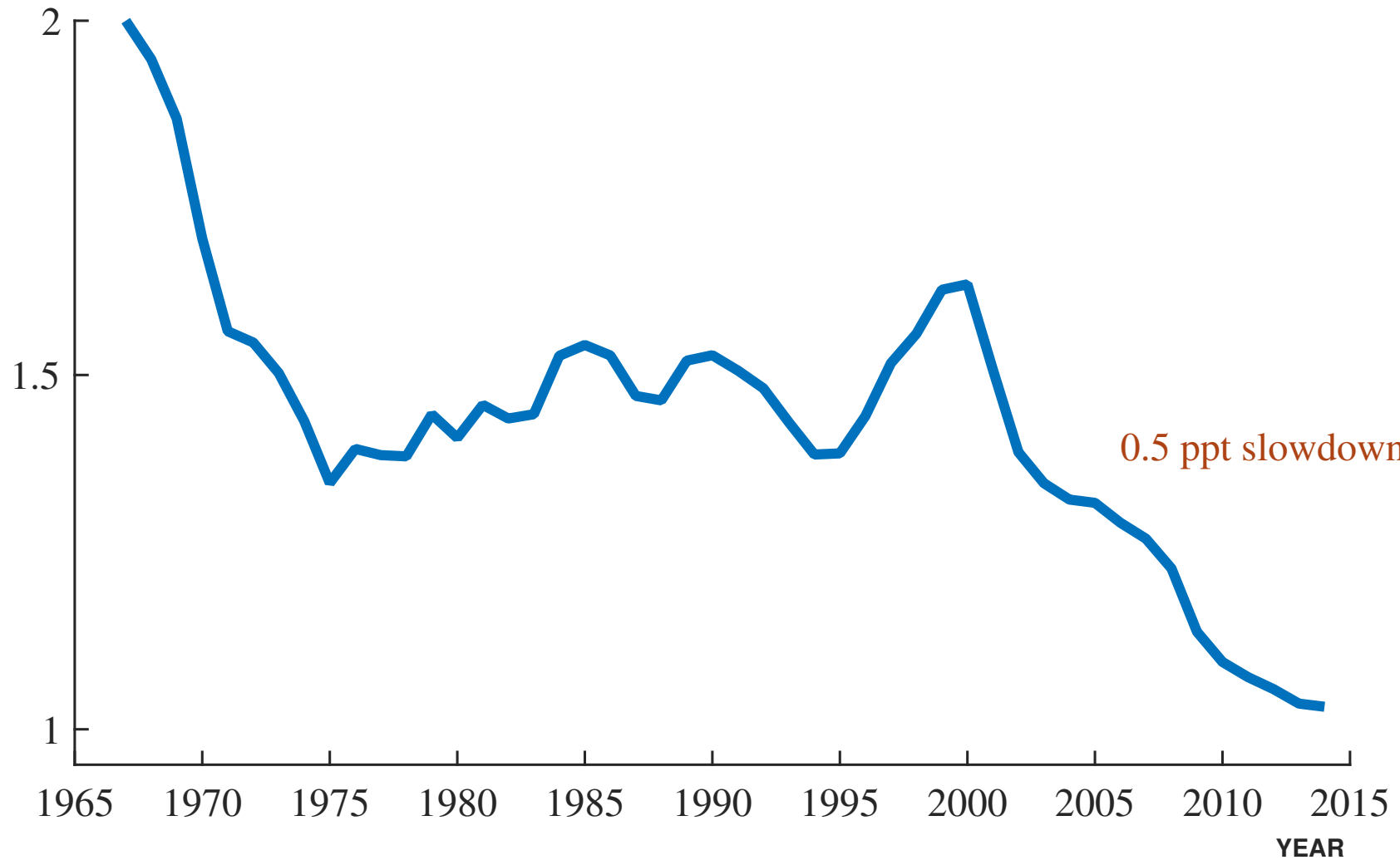
$$\text{Constant growth} \iff \beta = \frac{\text{Growth of } R_t}{\text{Growth of } A_t} = \frac{7.5\%}{1.5\%} = 5$$

- Dynamic forecast: feed through the time series of  $R_t$  into the idea production function above!

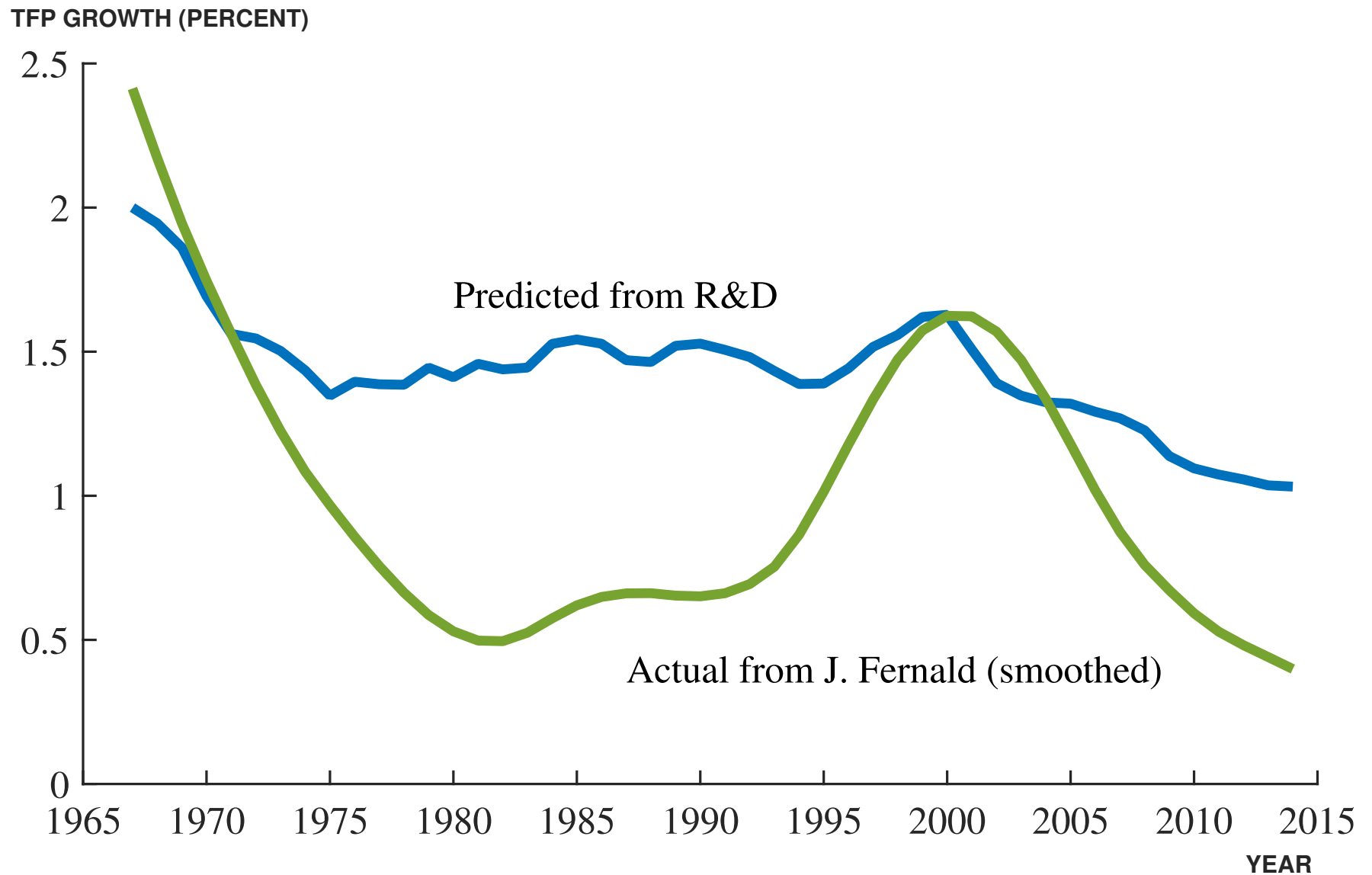


# Forecast of TFP Growth using Simple Model

TFP GROWTH (PERCENT)



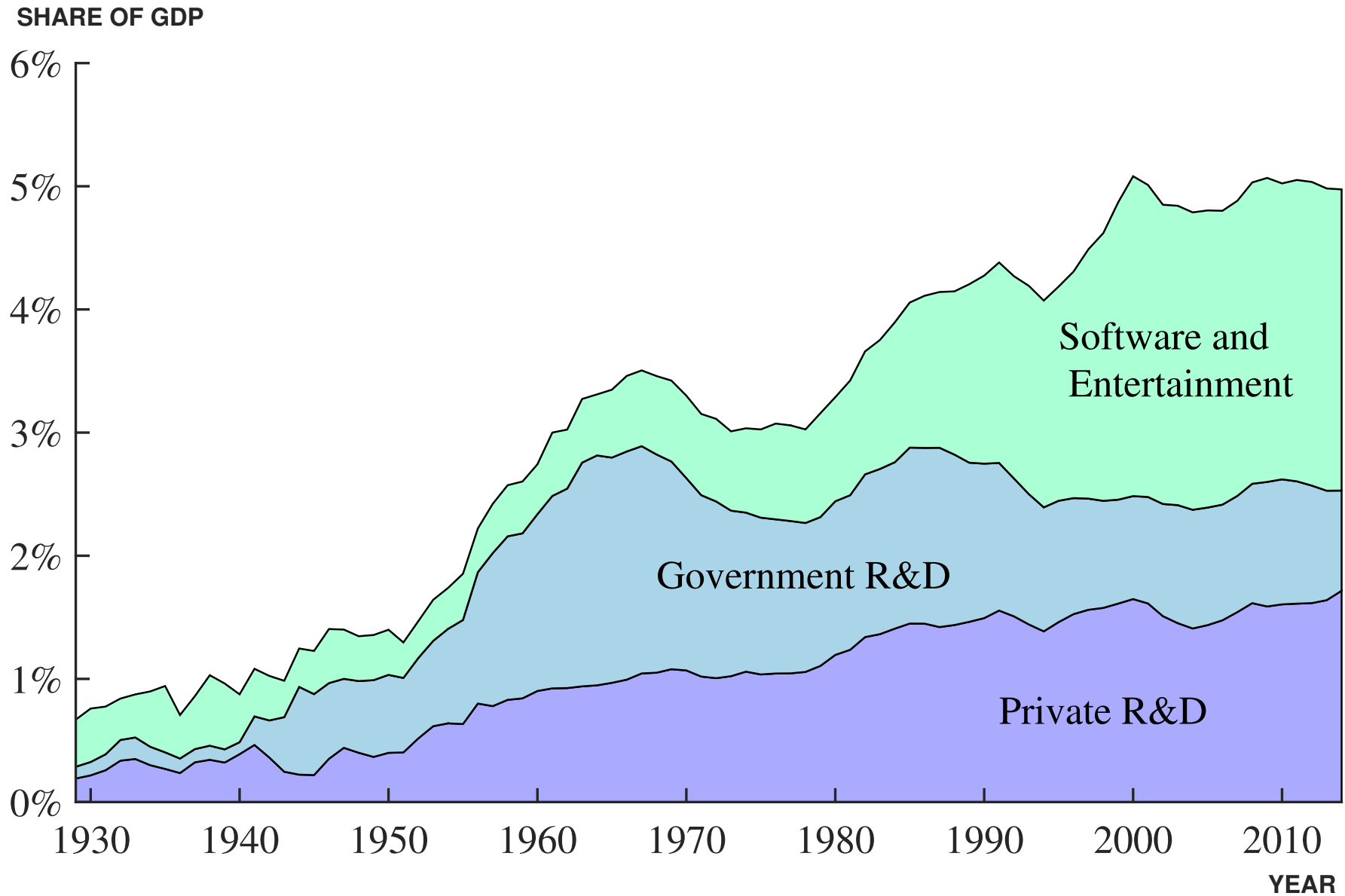
# Forecast of TFP Growth using Simple Model



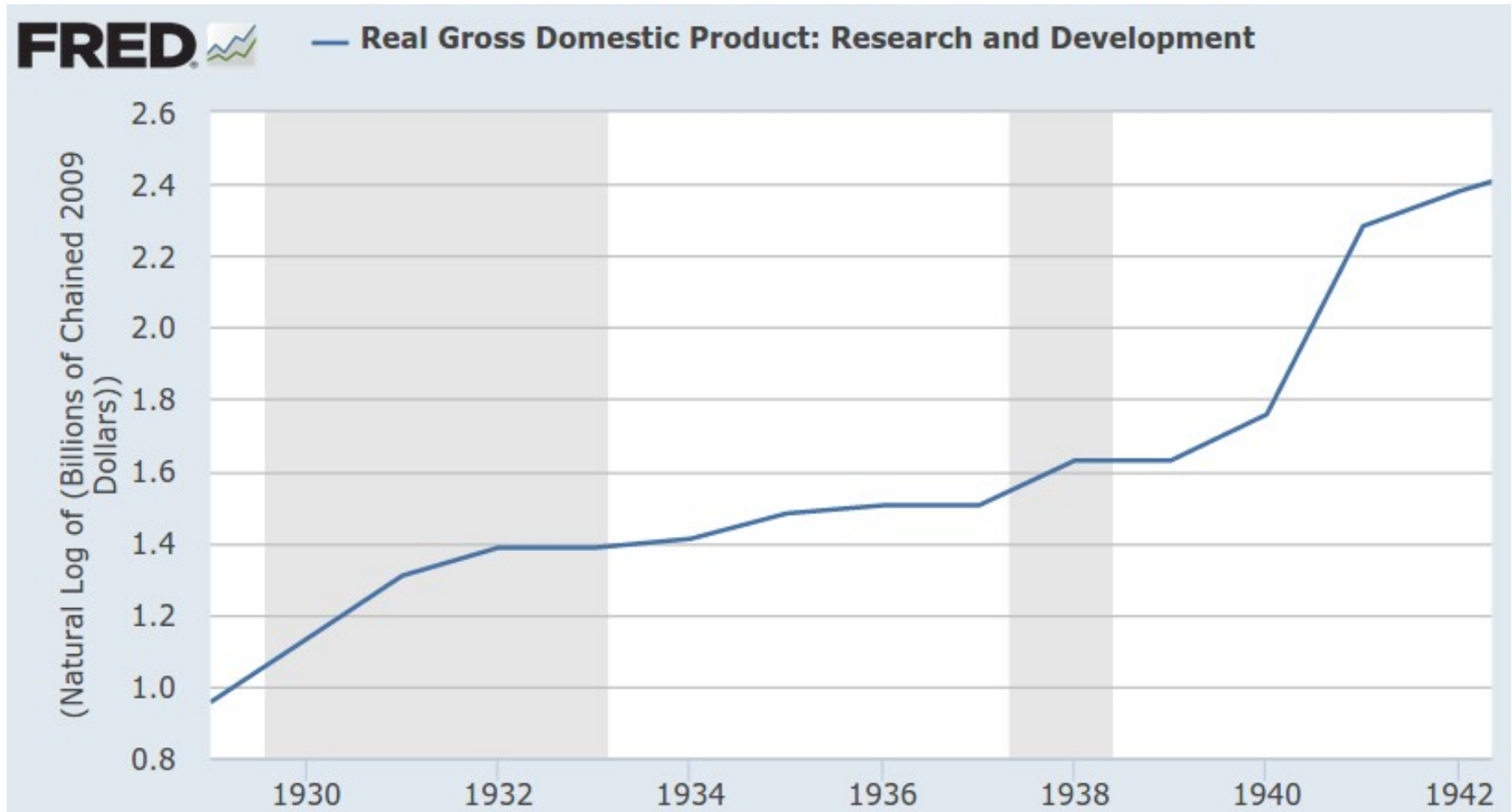
## Thoughts

- Surprisingly large decline of 1/2 ppt since 2000!
- But not obvious that 2008 looks different from 2001
  - Collapse of dot-com bubble seems more important?
- Even the large slowdown in R&D explains only a fraction of movements in TFP
  - A point dating back to Griliches and the 1973 productivity slowdown

# The Great Depression and 1930s?



In chained dollars: up by 40% (1929-33)!



## Why no decline?

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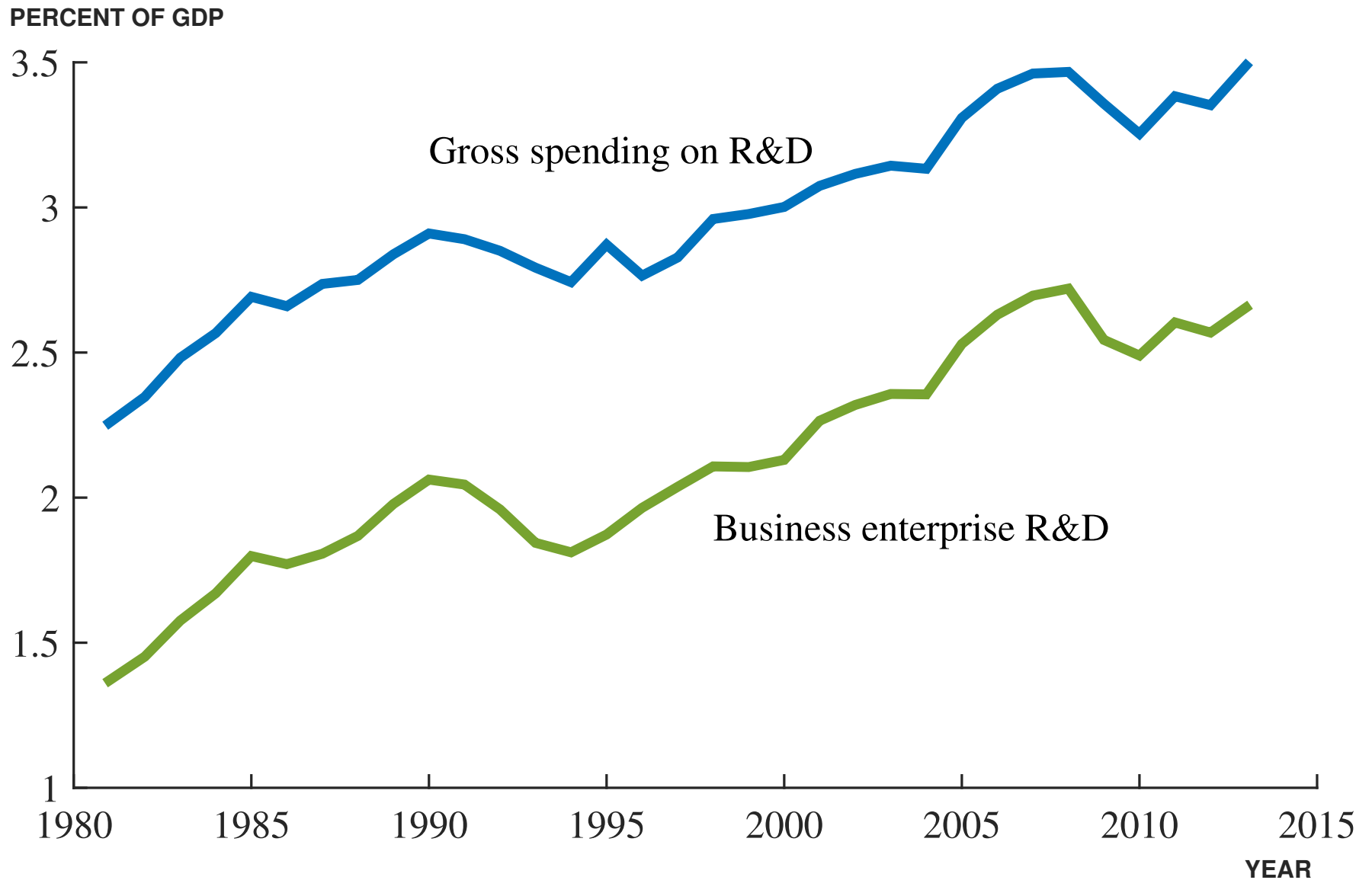
- Economic reasons?
  - Maybe the 1930s was a time when R&D productivity was especially high — discovered some “idea gold mines”
  - “During the [Great Depression], the U.S. economy was, in fact, experiencing a period of technological and organizational creativity that, in the aggregate, remains as yet unmatched.” — Alexander Field, 2011, p. 313-14.
    - 1929–1941 featured rapid TFP growth, and numerous innovations
    - Television, nylon, conveyor belts, stainless steel, chrome plating, quick-drying lacquer paints, new plastics, tungsten carbide blades, instrumentation.

## Why no decline? (continued)

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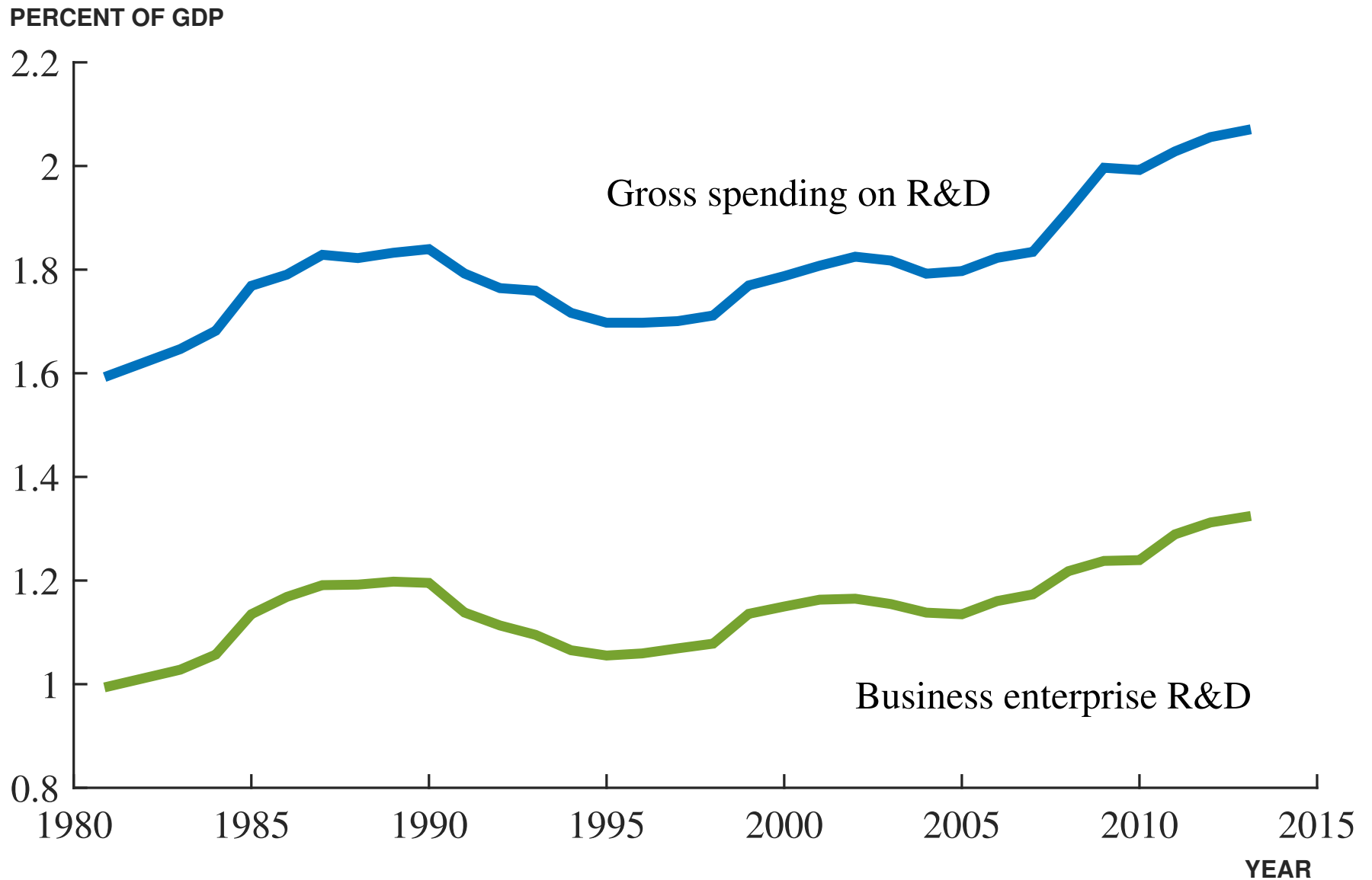
- Measurement problems?
  - We know R&D expenditures does not fully measure innovation effort
  - E.g. WalMart does zero R&D
- In any case, no strong evidence there for the Benigno-Fornaro hypothesis...

# R&D Spending in Japan (share of GDP)





# R&D Spending in Europe (15 EU countries)



## Thoughts

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- Contrast research and physical investment
  - Investment share of GDP often falls significantly
  - R&D share in Japan and Europe does not look like this
- Still can have effects since GDP itself is lower, but these are correspondingly smaller
- A bit surprising to me: I would have expected to see bigger effects in the R&D data.
- Look across industries? International spillovers?

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## Conclusions

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- Intriguing hypothesis — ring of truth
- Suggestive evidence of this force at work after 2000 in U.S.
- Smaller effects in Great Depression, Japan, and Europe?  
Why?