Index Funds, Asset Prices, and the Welfare of Investors

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Motivation

Index funds were introduced to "allow middle-class investors to achieve market returns". (Jack Bogle)

Do they accomplish this goal?

Partial equilibrium analysis $\rightsquigarrow$ yes.

But if index funds are large enough to affect prices then a partial equilibrium analysis is no lon appropriate – we need a general equilibrium analysis.

What do we do?

- Build a simple *general equilibrium* model in which heterogeneous investors hold individual stocks, index fund, risk-free bond.
- Define notion of equilibrium in the model.
- Prove existence of equilibrium.
- Provide simulations showing investor choices, asset prices, investor welfare as functions of the cost of indexing.

What do we find?

- Indexing $\rightsquigarrow$ reduced risk of investing in stock.
- Reduced risk of investing in stock $\rightsquigarrow$ increased demand for stock.
- Increased demand for stock $\rightsquigarrow$ higher equilibrium asset prices.
- Net: Indexing *decreases* the welfare of investors

Caution: This is a model.

Model: Overview

- The model is static; represents two moments in time.
- One representative Fund.
- Many identical firms.
- Idiosyncratic and Aggregare shocks
- Heterogeneous investors characterized by risk attitude and invested wealth.
- There is no trade.
- Investors hold portfolios of stocks, fund, bonds..
- Consumption/investment choices already made.

Firms

- N identical firms (in many small industries)
- Idiosyncratic shocks; mean 0 (e.g. cost shocks)
- Market-wide shock; mean 0 (e.g. demand shock)
- Firm behavior is summarized by random profit

Single (representative) Fund

- Fund charges a fee $k \geq 0$ as fraction of AUM
  Fund does not maximize profit.
- Fund invests AUM uniformly across entire market

Bond

- Single riskless bond
- Return $= 1 + \rho$, $\rho \geq 0$

Investors

- Non-atomic continuum of Investors $[0, T]$; $0 < T \leq \infty$
- Investor t characterized by
  - Choice set $X_t = \mathbb{R}^3_+$
    - ⋆ shares in a single firm (proxy for costly diversification)
    - ⋆ shares in Fund
    - ⋆ bonds
  - Invested wealth w_t
  - Utility U_t for random consumption
- Distribution ϕ, total mass M

Equilibrium

Equilibrium Quantities

- Price for firms p
- Investor choices x_t

Equilibrium Conditions

- Investors maximize (random) utility subject to budget constraint
- Demand for stock in firms $=$ Supply of stock in firms

Theorem *Equilibrium Exists.*

Simulations: Questions

How do

- investor choices
- asset price
- investor welfare

Depend on

- distribution of wealth & risk aversion
- absence/presence of Fund
- fee charged by of Fund

Simulations: Parameters, Guideline $\sim$ 1980

- Number of publicly traded US firms: $\sim 5,000$
- Market capitalization $\sim$ \$1 Trillion
- Value of bond market: $\sim$ \$0.5 – 1.5 Trillion
- Simulation: total invested wealth $W =$ \$2 Trillion
- Number of investors $\sim$ 100 Million

Simulations: Investors

Investors maximize expected CARA utility:

$$u_t(y) = (1 - e^{-ty})/(1 - e^{-t})$$

Scaling: $y =$ terminal wealth$/10,000$

Distributions

- Distribution of wealth w_t is exponential
- Distribution of risk aversion t is uniform on $[0, 5]$
- Wealth is concentrated:
  - top 20% of investors have 62% of wealth
  - bottom 20% of investors have 2% of wealth
- Richest investors are least risk averse
- Poorest investors are most risk averse

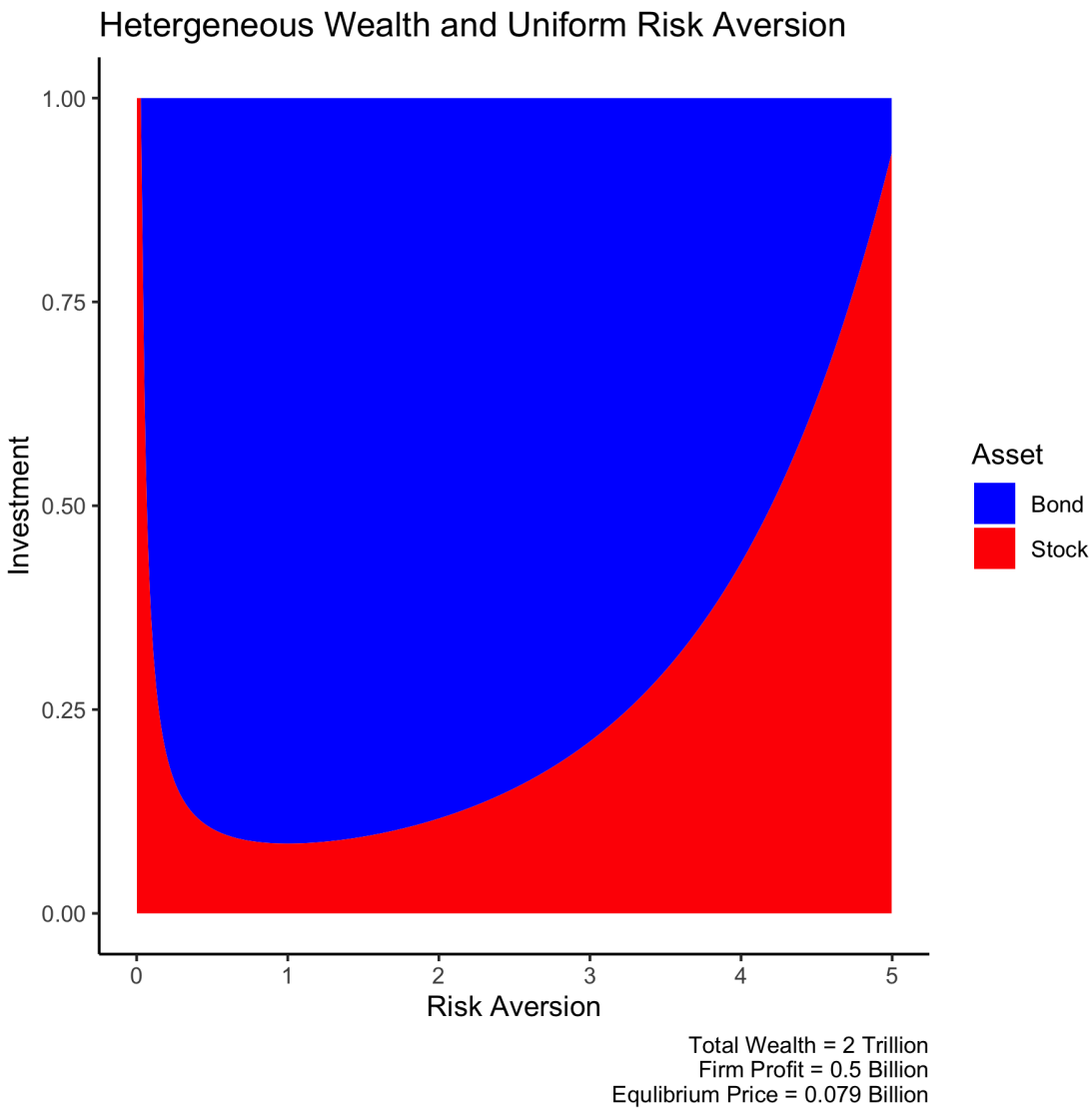
Simulations: Firms

- Expected profit of each firm: $\pi = \$500$ Million
- Idiosyncratic risk: $\epsilon = \pm 50\%$, equal probabilities
- Market risk: $\Delta = \pm 50\%$, equal probabilities

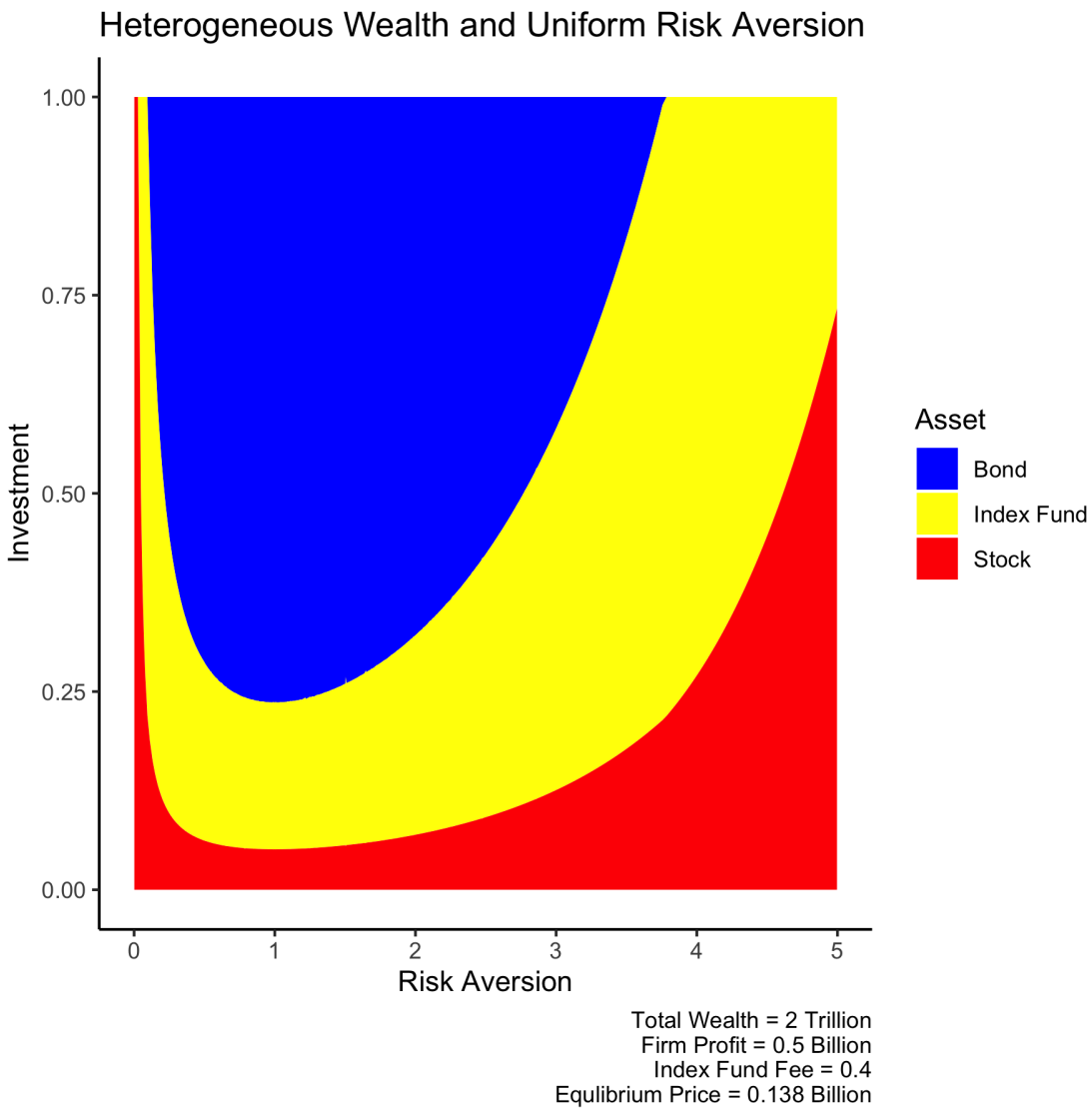
Remaining Parameters

- Interest rate $= 50\%$
  $\rho = 0.5$
- Fund fee(s) $k = 0, 0.01, ...1.00; \infty$
- $k = 0$: limiting benchmark
- $k = \infty$: no fund

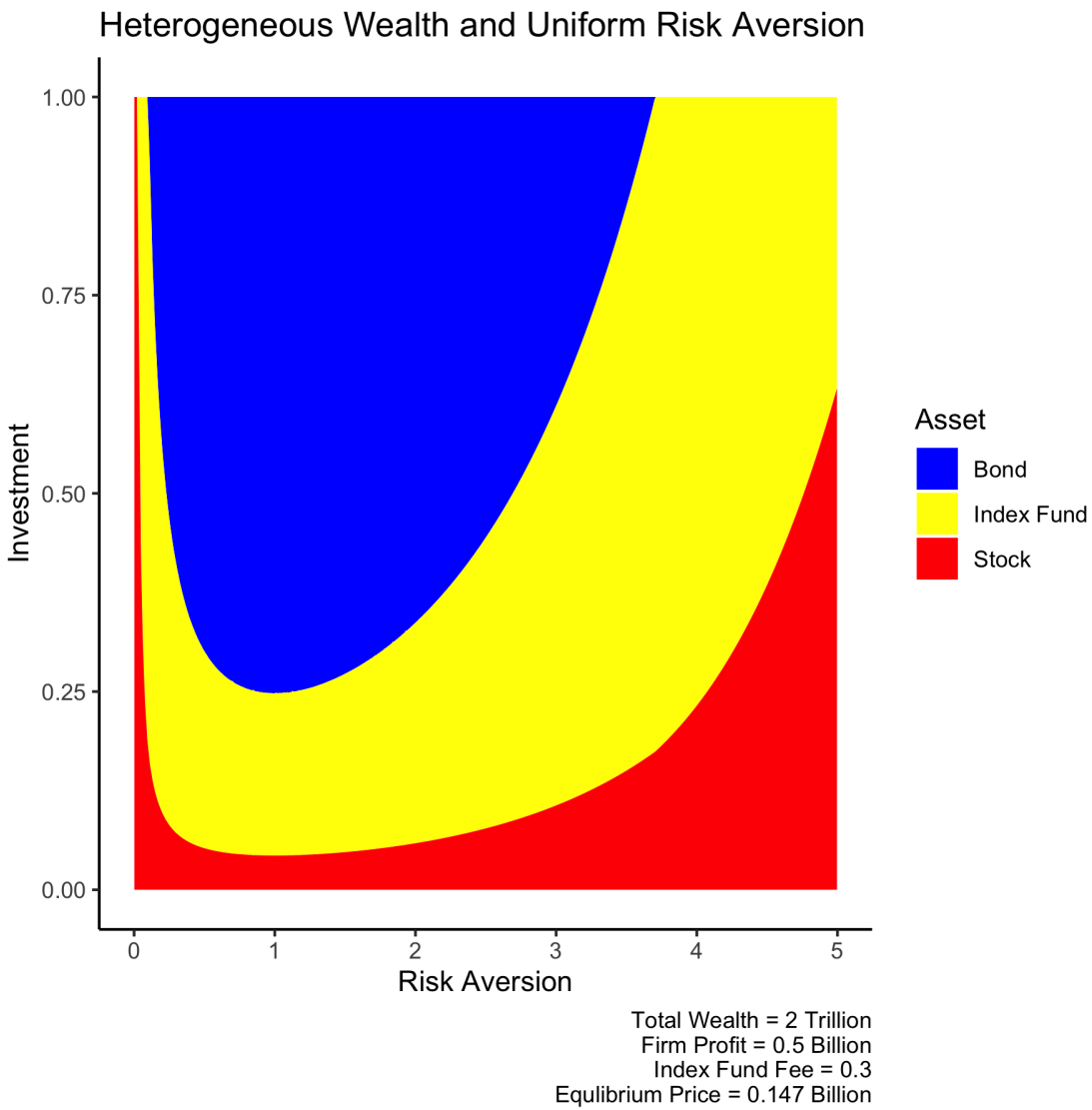
Portfolio Choices: $k = \infty$



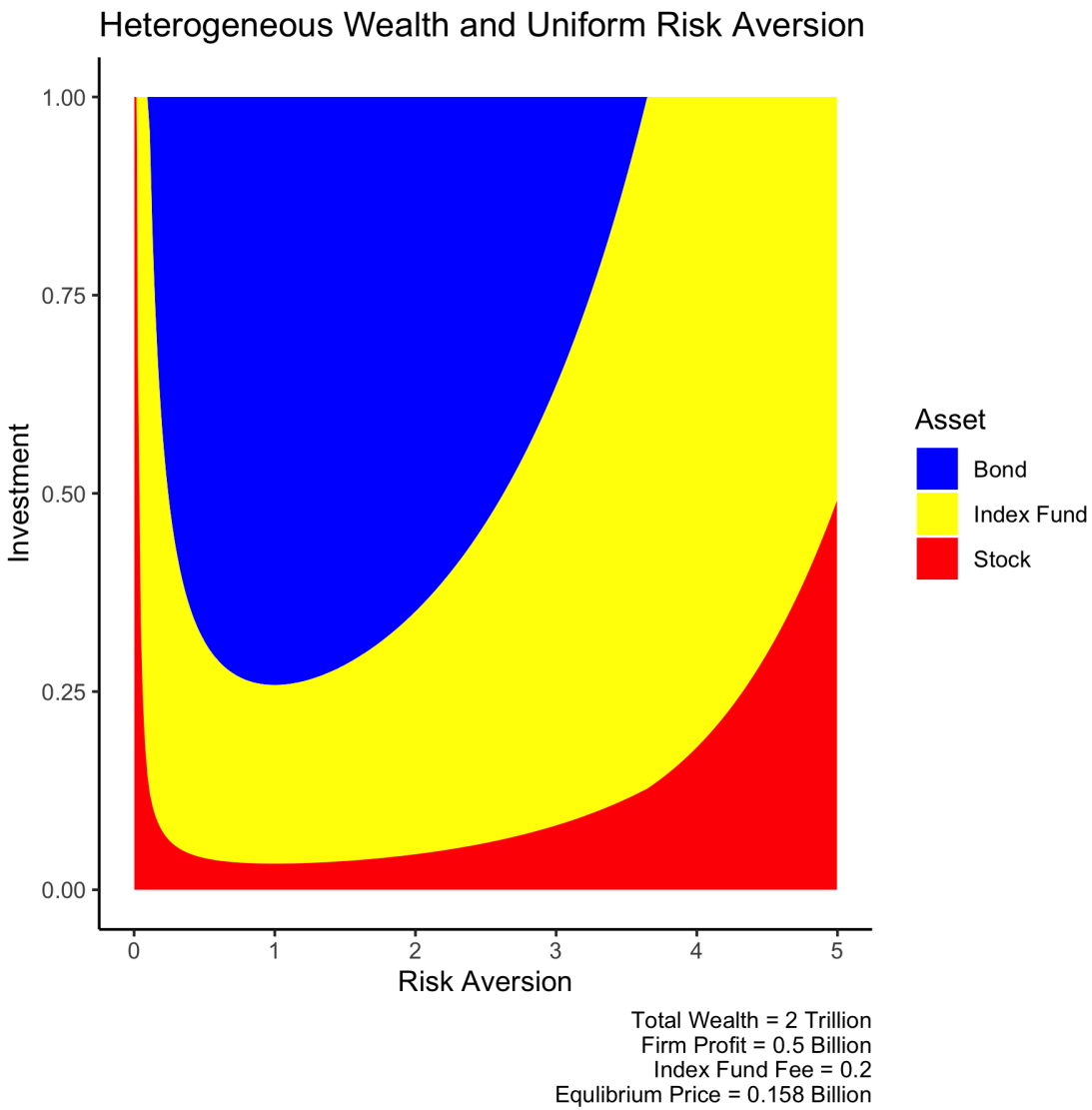
Portfolio Choices: $k = 0.4$



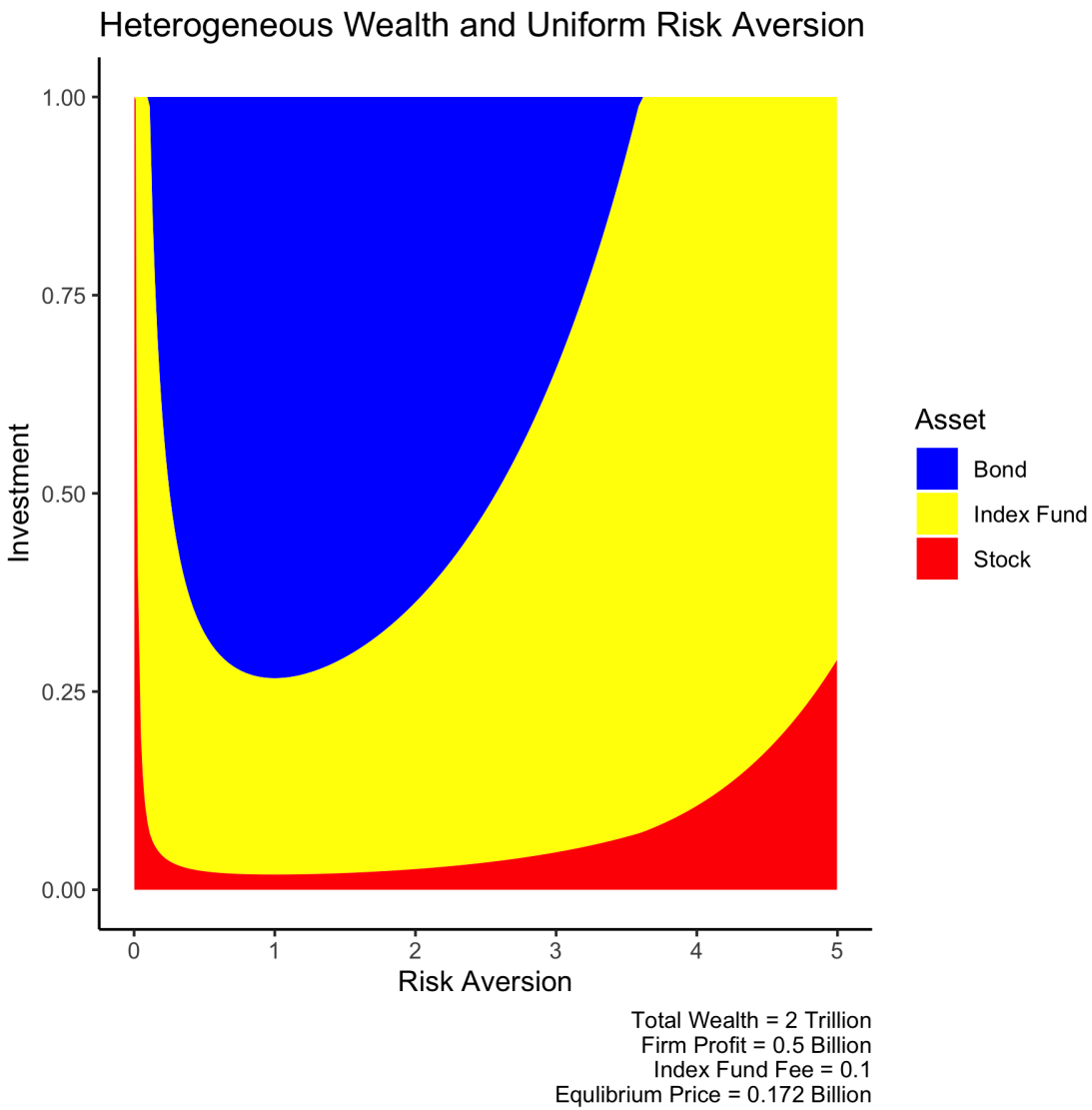
Portfolio Choices: $k = 0.3$



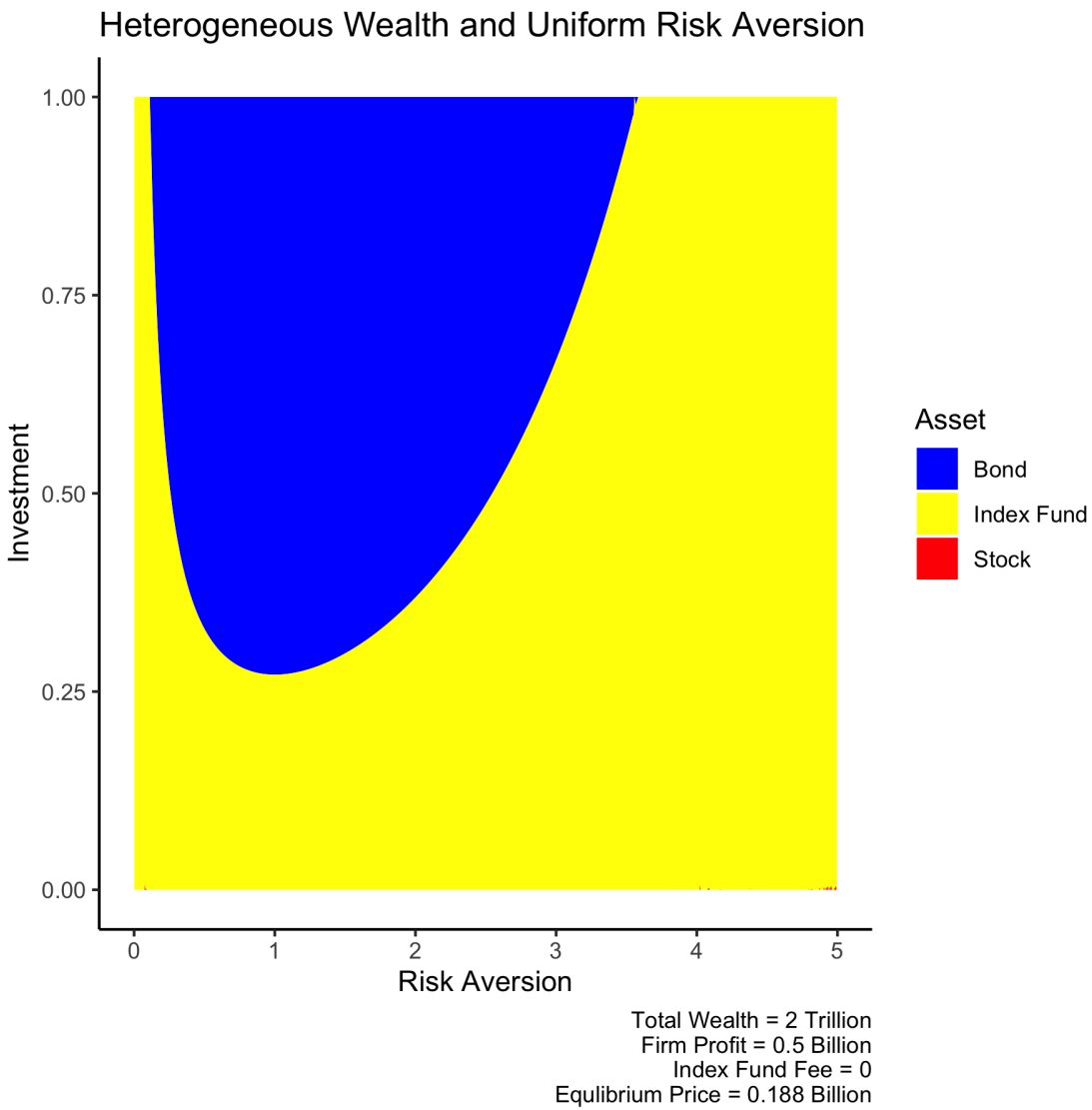
Portfolio Choices: $k = 0.2$



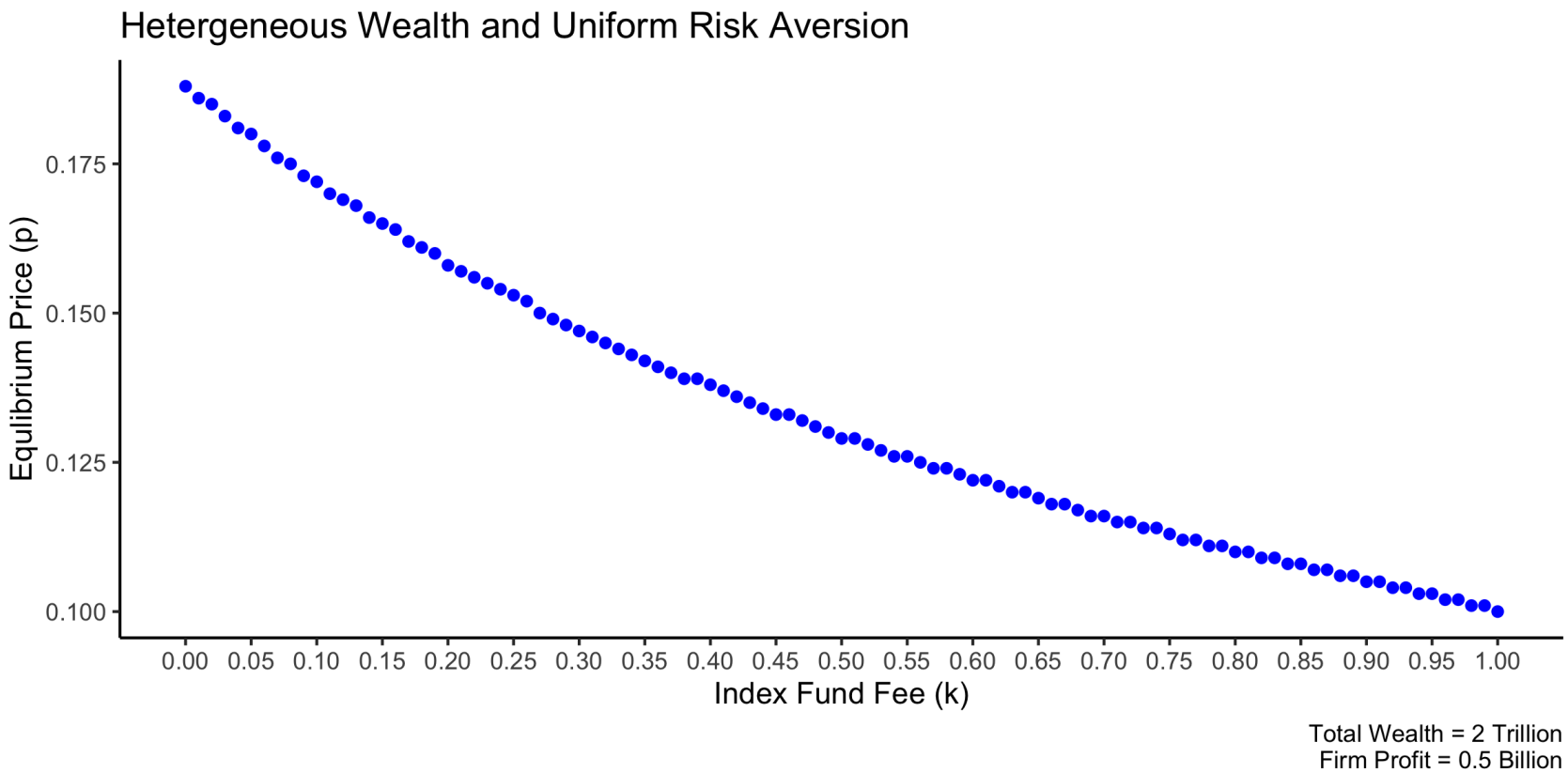
Portfolio Choices: k = 0.1



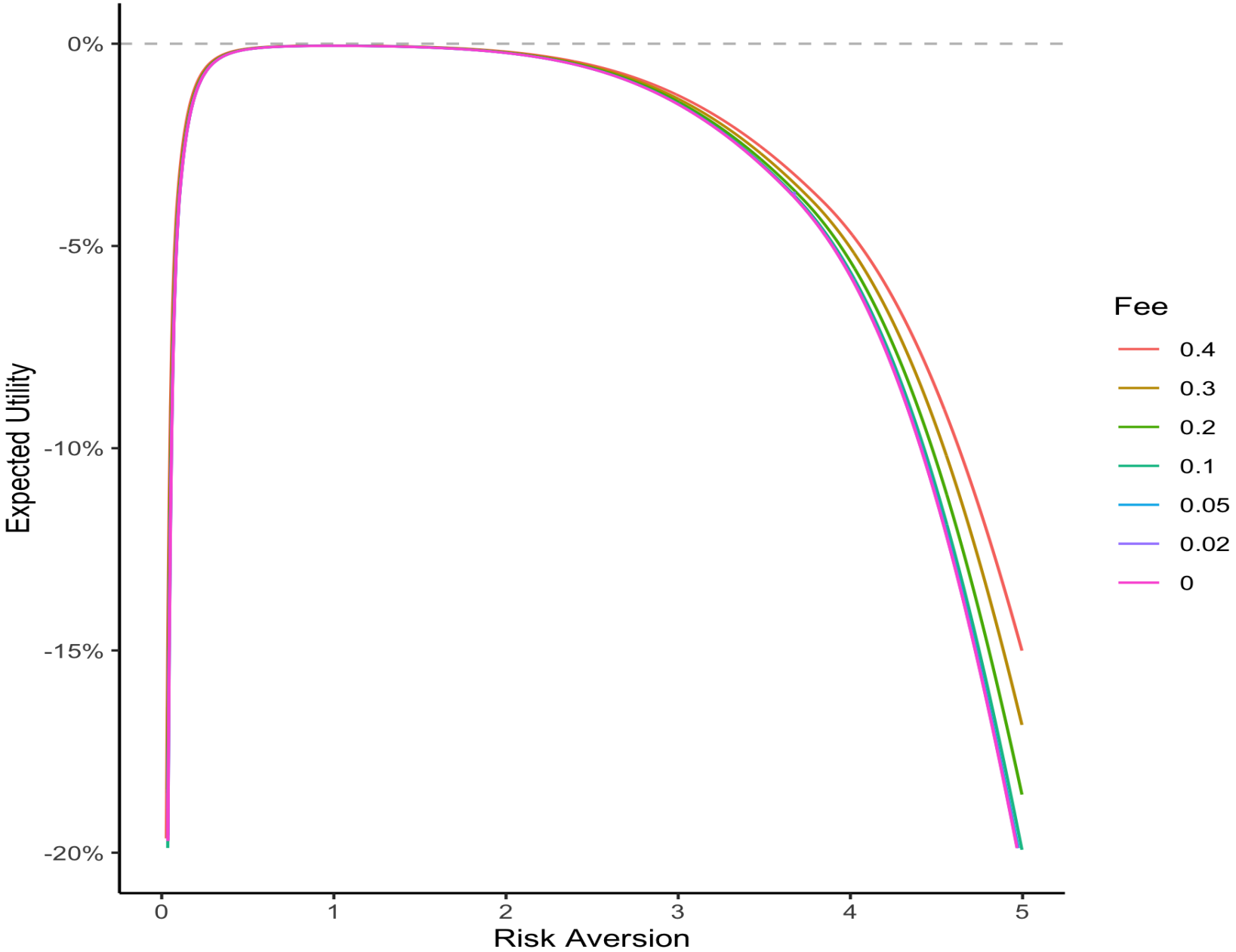
Portfolio Choices: $k = 0$



Asset Price and Cost of Indexing



Welfare Relative to $k = \infty$ (no Fund)



Summary Conclusion

- Index Funds benefit the marginal investor.
- Index Funds harm investors as a whole.
- Tragedy of the Commons.

Caution We make many simplifying assumptions. *It's a model.*

More to Come

Extension: Fund ownership affects the behavior of firms.

- The Fund controls votes $\rightsquigarrow$ changes in oversight and governance $\rightsquigarrow$ changed firm costs and industry outcomes (e.g. Anton et al. 2022)
- Higher asset prices $\rightsquigarrow$ lower cost of capital $\rightsquigarrow$ lower firm costs.
- Common ownership (Rotemberg 1984),

Changes in firm behavior $\rightsquigarrow$

- changes in equilibrium asset prices
- changes in *investor* welfare
- changes in *consumer* welfare