

# A Persistent Underinvestment Puzzle

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University of California  
Agricultural Issues Center



Department of Agricultural  
and Resource Economics

# Motivation

## 1. Shifting patterns of public support for R&D

- **High-income countries**
  - spending slowdown
  - diminishing share for on-farm productivity enhancement
- **A different pattern in Brazil, China, and India**

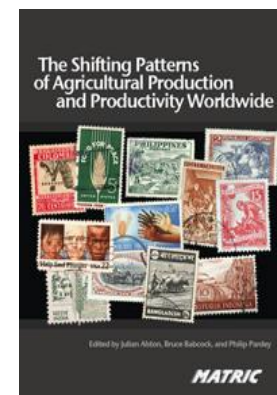
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## 2. Shifting productivity patterns

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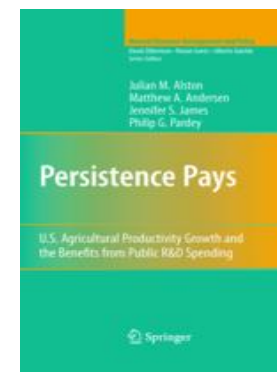
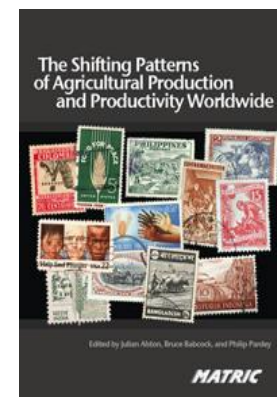
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## 3. High rates of return to agricultural R&D

- **Implies persistent underinvestment—why is it so?**





# **General economics of levy-funded R&D**

# Options for Financing

- **Research and extension and other (commodity) collective goods**

## **Include**

- **Private funds**
- **National, state, or local government general revenues**
- **Voluntary commodity levies (or check-offs)**
- **Mandatory commodity levies (hypothecated taxes)**

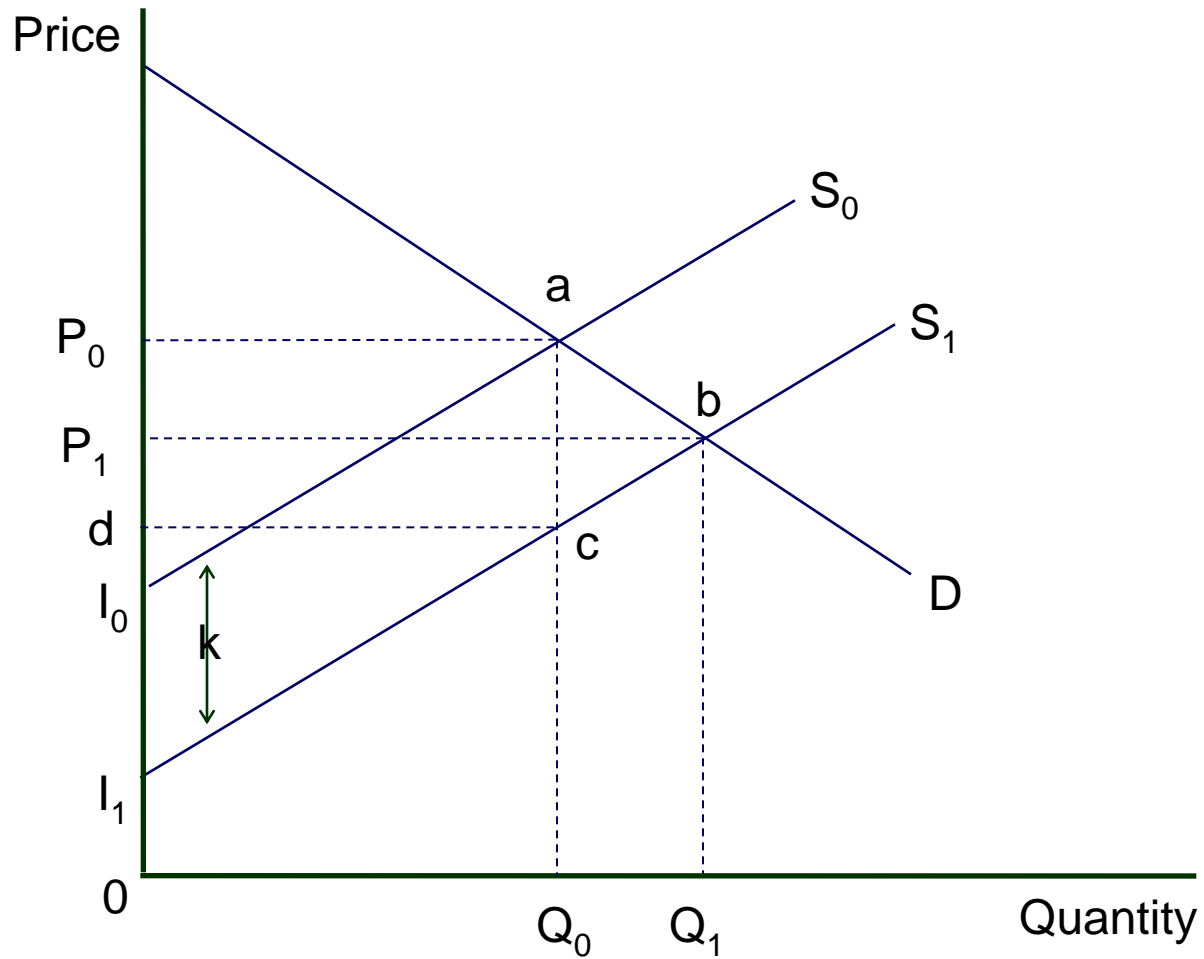
# Efficiency

- **Greatest total net benefits for the**
  - Nation?
  - Industry?
  - Farmers?
  
- **Elements of efficiency**
  - Least-cost funds
  - Total budget
  - Mix of projects and programs
  - Management of resources

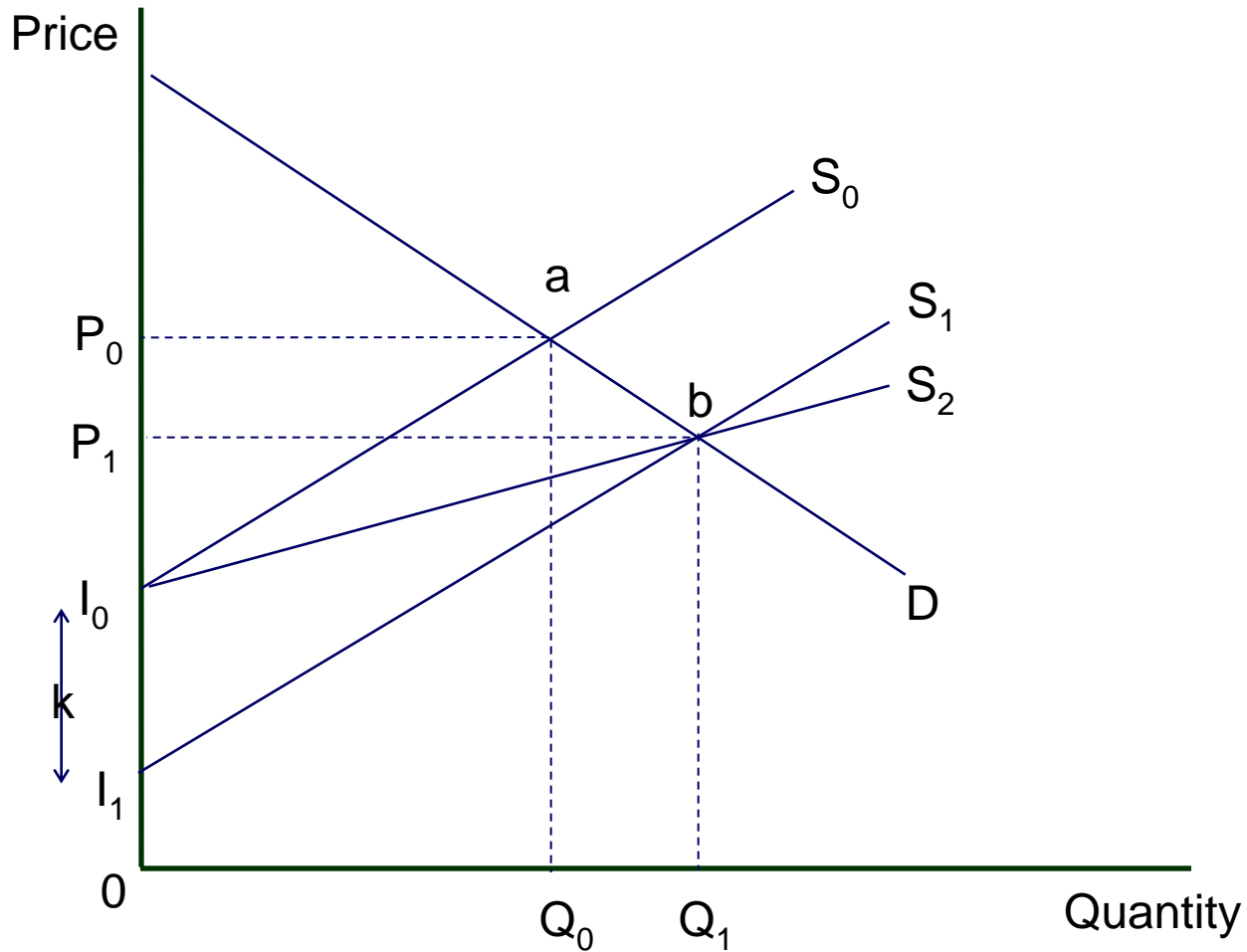
# Equity

- **Vertical distribution of research benefits**
  - Input suppliers
  - Farmers
  - Processors, manufacturers, retailers
  - Consumers
- **Horizontal distribution of research benefits**
  - Adopters versus non-adopters
- **Different types of R&D**
- **Distribution of costs of levy**

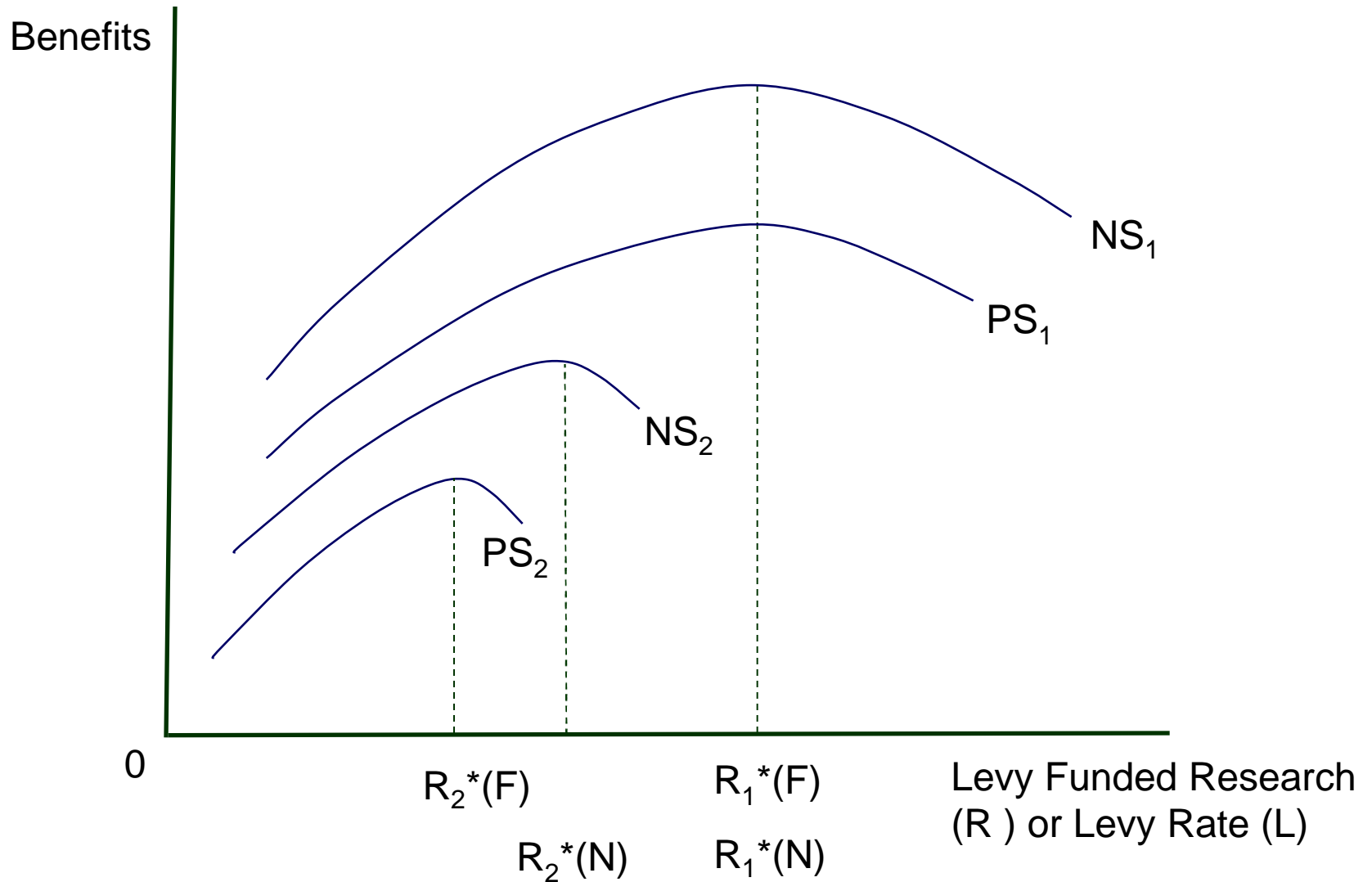
# Commodity-Market Model with a Parallel Shift



# Commodity-Market Model with a Pivotal Shift



# Producer and National Incentives



# Parallel vs Pivotal vs Other Shifts

- **Representative firm or industry models tend to imply multiplicative supply shifts (or equivalent)**
  - **Hard to model parallel shifts**
  - **Many models more consistent with pivotal story**
- **Heterogeneous firms, entry and exit, and differential adoption patterns might yield any kind of shift (incl. parallel)**
- **For most Australian farm commodities a small-country assumption is reasonable**
  - **100 percent of benefits will accrue to producers regardless of the nature of the research-induced shift of farm product supply**

# “Vertical” Dimensions of Equity

- **100 % levy funding is fair and efficient if costs are distributed in proportion to benefits**
- **Might not hold if . . .**
  - Levy and research apply to different points in the production chain and we have variable factor proportions
  - Nature of technological change means the supply shift is non-parallel
  - Imperfect competition or other market distortions

# “Horizontal” Dimensions of Equity

- **Costs of levy**
  - Borne by producers according to their production
  - This does not depend on whether they adopt technology
  - If adoption affects price, non-adopters are doubly worse off
- **Research lags => intergenerational inequity**
  - Current producers pay levy
  - Future producers benefit, 10-30 years later?
- **Mismatch arises when research has**
  - Narrowly defined beneficiaries, say by region or farm types
  - Benefits accruing outside the industry (e.g., environmental)

# Horizontal or Vertical Inequity

- **Inefficient outcomes in terms of**
  - Under-funding overall
  - Distortions in the mix (sacrifice of efficiency for equity)
  - Under-funding of research with
    - Benefits narrowly confined within the industry
    - Benefits only partially confined within the industry
- **Gives equity and efficiency basis for**
  - Multiple levies collected at different points in the marketing chain to fund different lines of research
  - Matching government grants – but how much?

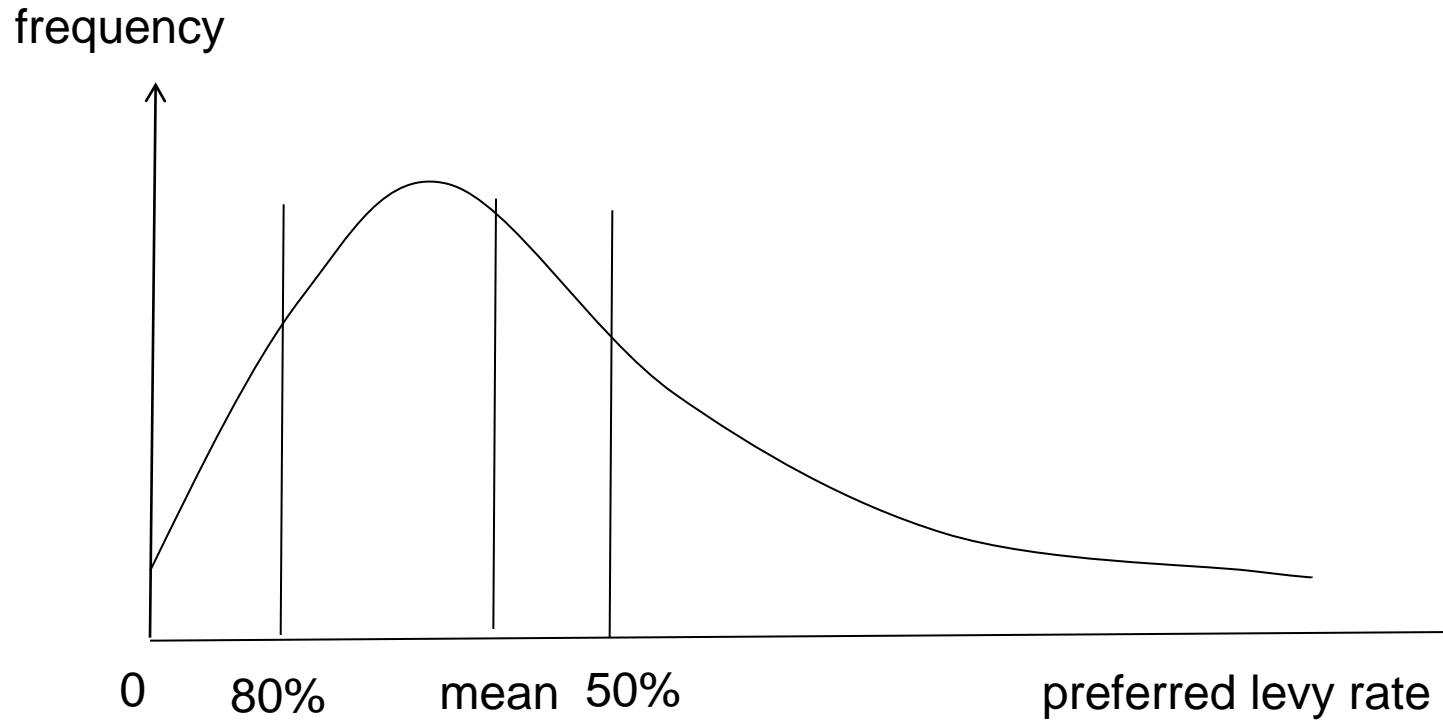
# Further Complications

- **Economies of size, scale, and scope**
  - Aggregate across commodities, regions, production stages
  - Reduce the number of distinct levy-based funds
  
- **Tradeoff against diseconomies of diversity**
  - Transaction costs, information costs, incentive problems
  - Distortions in the portfolio (for “political” reasons)

# Sources of Underfunding?

- **Skepticism about evidence provided by economists or agricultural scientists**
- **Uncertainty about who will benefit and when**
- **Long, variable, lags**
  - 20-50 years exceeds the life expectancy of most current farmers
  - Do farmers assume research benefits will be capitalized into land they own?
- **Diversity among farmers and other constituents in terms of their actual and perceived benefits**
  - Murray Fulton, supermajority idea

# Effects of Diversity and Supermajority Rules



# Market Failure vs Institutional Failure?

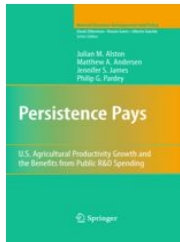
- **Responses to Institutional Failure**
  - **Alternative Institutions!**
- **Intellectual property rights**
  - **Appropriable returns to inventors (e.g., end-point royalties)**
- **Mandatory levies**
  - **Hypothecated taxes, with rates not chosen by plebiscite of growers**

■ **Thank You!**

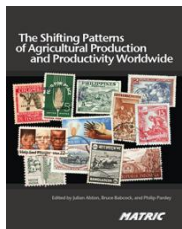
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# Selected Sources



Alston, J.M., M.A. Andersen, J.S. James, and P.G. Pardey. ***Persistence Pays: U.S. Agricultural Productivity Growth and the Benefits from Public R&D Spending***. New York: Springer, 2010.



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