

Business Method Patents & US Financial Services[#]

9th Annual Bank of Finland/CEPR Conference: Innovation and Intellectual Property in Financial Services

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*: The views expressed here are my own and not necessarily those of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

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What is Financial Innovation?

- New financial products & services
 - New financial instruments, derivatives, & means of payment
 - Transformation of instruments – securitization, tranching etc.
- Improved processes for delivering existing services
 - Internet banking
 - Truncation & electronic presentment of paper checks
 - Electronic trading platforms
- Improved underwriting or controls
 - Credit scoring technology
 - Credit risk modeling, fraud detection etc.
 - Pricing algorithms, arbitrage strategies, & hedges

Who Does Financial Innovation?

- Providers of all kinds of financial services
 - Often in division IT departments
 - But also in marketing groups (e.g. Cap One build your own card)
- Payments processors
 - Credit, debit, & ATM networks
- Financial exchanges
 - CME/NYMEX/NYSE
 - Traders/specialist who are members of the exchanges
- Technology Vendors
 - Typically large ICT firms; also some specialist IT firms
 - Design & market solutions for large and small financial institutions
- End users
 - Investment & trading strategies

How Do Financial Firms Protect Their Innovations?

- Peter Tufano, “Financial Innovation and First-Mover Advantages,” *Journal of Financial Economics*, Vol. 25 (1989) , pp. 213-40.
- Peter Tufano, “Financial Innovation,” in George Constantinides, Milton Harris and Rene Stulz, eds. *The Handbook of the Economics of Finance*. North Holland (2004).

Lead time

Joint ventures*

Reputation & size

Regulatory barriers to entry*

Complementary assets

Network effects*

- Wesley M. Cohen, Richard R. Nelson, and John P. Walsh, “Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not),” NBER Working Paper No. 7552 (2000).
- Richard C. Levin, and Alvin Klevorick, Richard Nelson, and Sidney Winter, “Appropriating the Returns From Industrial Research and Development,” *Brookings Papers on Economic Activity* (1987), pp. 783-831.

Example - Network Effects on Financial Exchanges

- An exchange is more valuable when there are more traders
 - Rapid price discovery - trading partners are found more quickly
 - More efficient pricing - smaller bid-ask spreads
 - More depth - smaller price effects from large orders
 - Economizes collateral requirements (with central counterparty)
- Trading of a security is concentrated on a few exchanges
- Reinforces 1st mover advantages – new options contracts
 - Persistently high market share on 1st exchange that trades them
 - Other exchanges are minor players in the contract
 - See Silber (1981), Caskey (2003)

Patentability of Business Methods in the U.S.

- They were long thought to be unpatentable subject matter
 - *Hotel Security Checking Co. v. Lorraine Co.*, 160 F. 467 (1908)
- This exception was rejected by the Federal Circuit in 1998
 - *State Street Bank and Trust Co., Inc. v. Signature Financial Group, Inc.*, 149 F.3d 1368 (1998)
 - *AT&T Corp. v. Excel Communications, Inc.* 172 F.3d 1352 (1999)
- But the Federal Circuit is currently revisiting this decision
 - It recently reaffirmed that “mental steps” are not patentable
In re Comiskey, 499 F.3d 1365 (Fed. Cir. 2007)
 - It requested briefs on patentability of business methods generally
ex parte Bilski, No. 2007-1130 (Fed Cir pending)

What is a Business Method Patent?

- Class 705 Data Processing: Financial, Business Practice, Management, or Cost/Price Determination (e.g. *computer implemented* business methods)
- USPTO White Paper (2000) indicates these include, among others:

Identifying customers & their needs

Operations Research, Market Analysis

Advertising & Incenting Purchases

Advertising, Catalogs, Price Determination, Coupons

Exchanging Money & Credit, Insurance

Underwriting, Loan Processing, Point of Sale Systems, Billing, Funds Transfer, Clearinghouses, Investment Planning, Tax processing, Risk Management

Tracking Resources, Money & Products

Accounting, Inventory Management, Scheduling, Human Resources

A Few Interesting Financial Patents

Patent No.	Year	Description
4,839,804	1989	The <i>College Sure</i> Certificate of Deposit
5,677,955	1997	Personal Online Banking (Intuit)
5,848,400	1998	Electronic Check Clearing and Settlement
5,978,485	1999	Foreign Exchange Transaction System
6,017,063	2000	Financial Certificates (inflation indexed bonds?)
6,076,074	2000	Intraday Netting Payment Finality
6,078,903	2000	Modeling Risks of Loans in a Financial Portfolio (KMV)

Summary:

2 patents on financial instruments

2 patents on large dollar payment systems

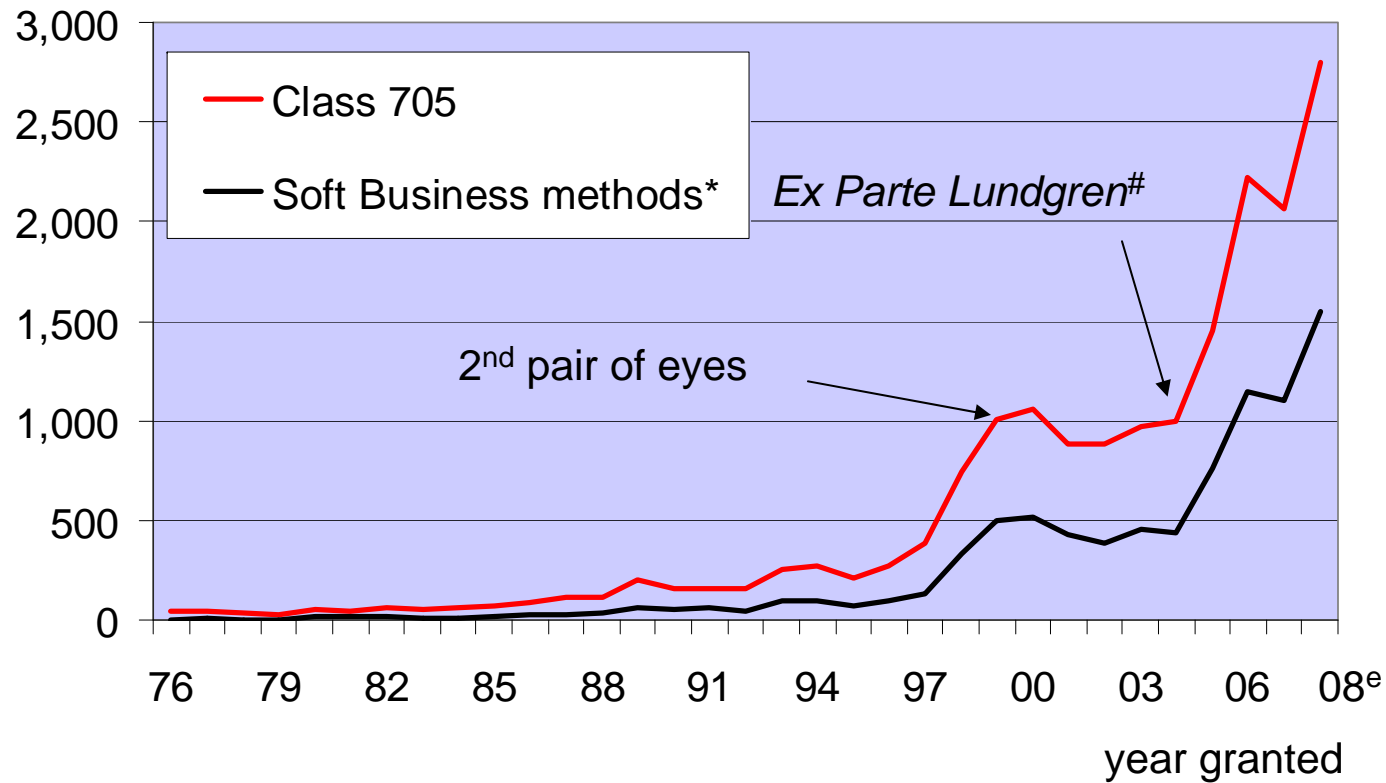
2 patents on improvements to existing banking services

1 patent on measuring credit risk

A Non-random Sample of Patents Granted in 2008

Description	Assignee
A system and method of calculating prepayment and default risk, loss given default, and default correlations for the purpose of valuing a portfolio of assets (no. 7,340,431).	Freddie Mac
A method of assessing the capital adequacy of an automotive finance company (no. 7,346,566).	Ford Motor Company
A method and system for calculating marginal cost curves for electricity generating plants (no. 7,333,861).	NeuCo, Inc.
A computer-implemented method of computing price elasticities, choosing from one or more demand models based on goodness of fit (no. 7,343,355)	i2 Technologies US, Inc.

Business Method Patents Issued in U.S.

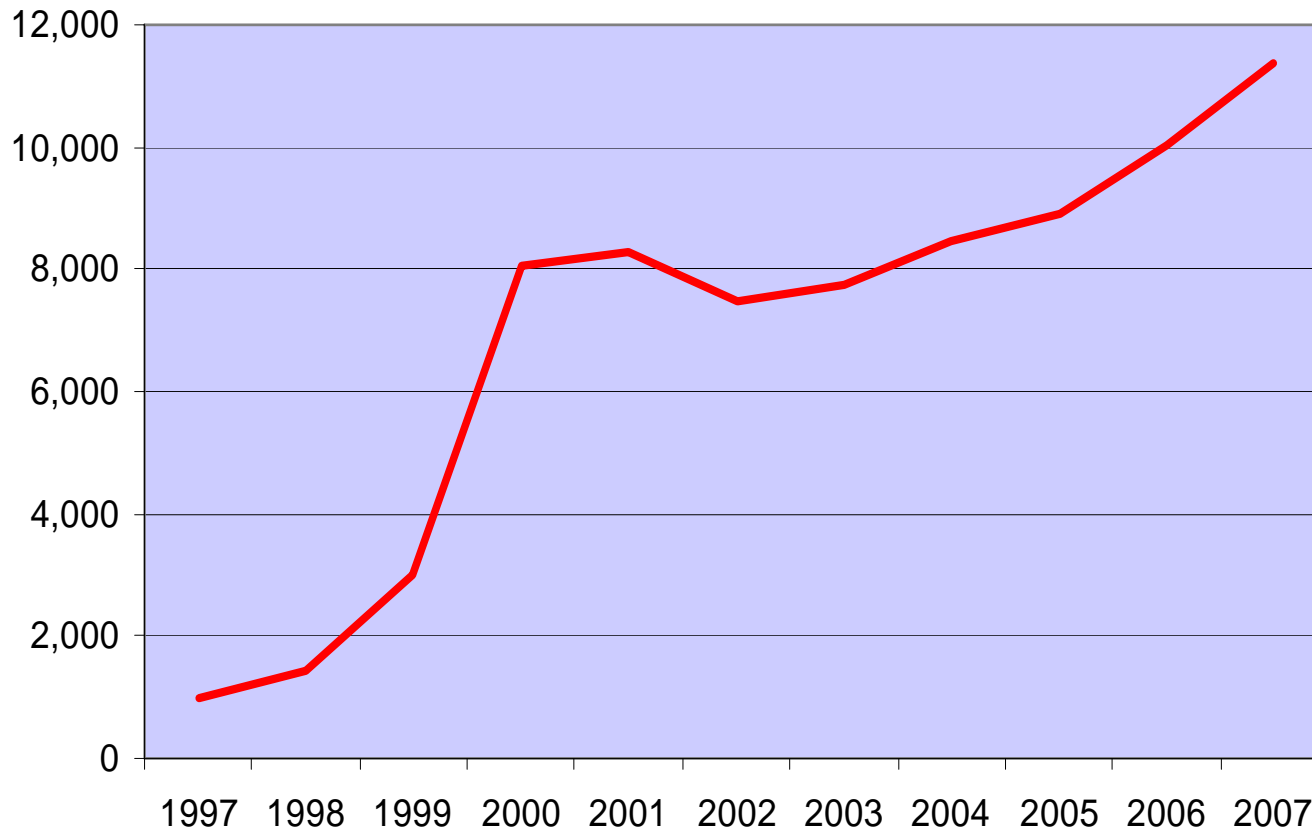


e: The 2008 total is estimated from 5 months of data

*: See appendix for details

#: Appeal No. 2003-2088 (BPAI 2005).

Applications for Business Method Patents*



Source: U.S. Patent and Trademark Office

*: Applications in Class 705, Counts by fiscal year.

Additional Facts

- About 12,000 BM patents have been granted
 - About 40,000 published BM applications are pending
- Financial institutions obtain relatively few BM patents
 - Only about 10% of the total BM patent grants in 2002-2007
 - Most of those patents were obtained by the largest institutions
- ICT firms account for a large share of BM patents
 - At least 1/3 based on visual inspection of assignees
 - More likely, they account for the vast majority of BM patents
- 4 in 5 BM patents are also software patents
 - Using definition of software patent in Bessen & Hunt (2007)
 - Based on key words, not patent classifications

Financial Patents & Litigation

- Josh Lerner, “Trolls on State Street?: The Litigation of Financial Patents, 1976-2005,” mimeo, Harvard Business School (2006)
- Studies 3,000 patents granted in 1976-2003 period
 - ICT companies obtained most of these patents
- Financial patents are litigated relatively frequently
 - *The rate is 27 times that of patents in general*
 - More than 14 times the litigation rate for pharmaceuticals
 - N.B.: these are suits filed; not trials
- Large firms are not typically the plaintiffs
- Defendants are typically large firms or financial exchanges

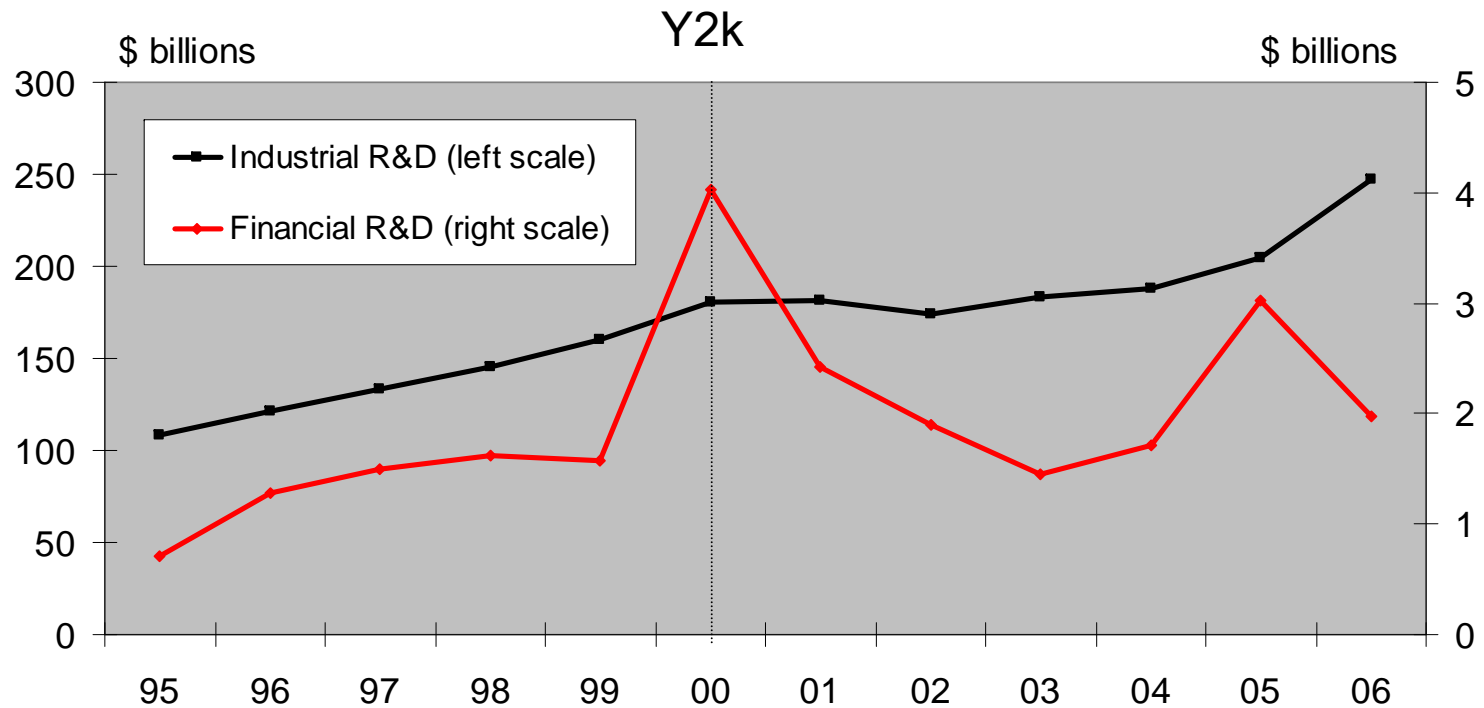
A Concern: Standard Setting & Potential Hold-up

- The financial sector relies extensively on standard setting
 - Interoperable trading platforms
 - Nearly universal access to payment systems
 - Settlement procedures & collateral management
- Advantages & disadvantages
 - Contributes to increasing returns to scale
 - Creates technological lock-in for participating users
- Added vulnerability to patent injunctions?
 - Users don't want to sacrifice their fixed investments
- Do network effects work against financial firms?
 - Large gross margins may encourage litigation
 - Network effects complicate calculations of incremental benefits
- Example – litigation over electronic check presentment

Have BM Patents Increased The Rate of Innovation?

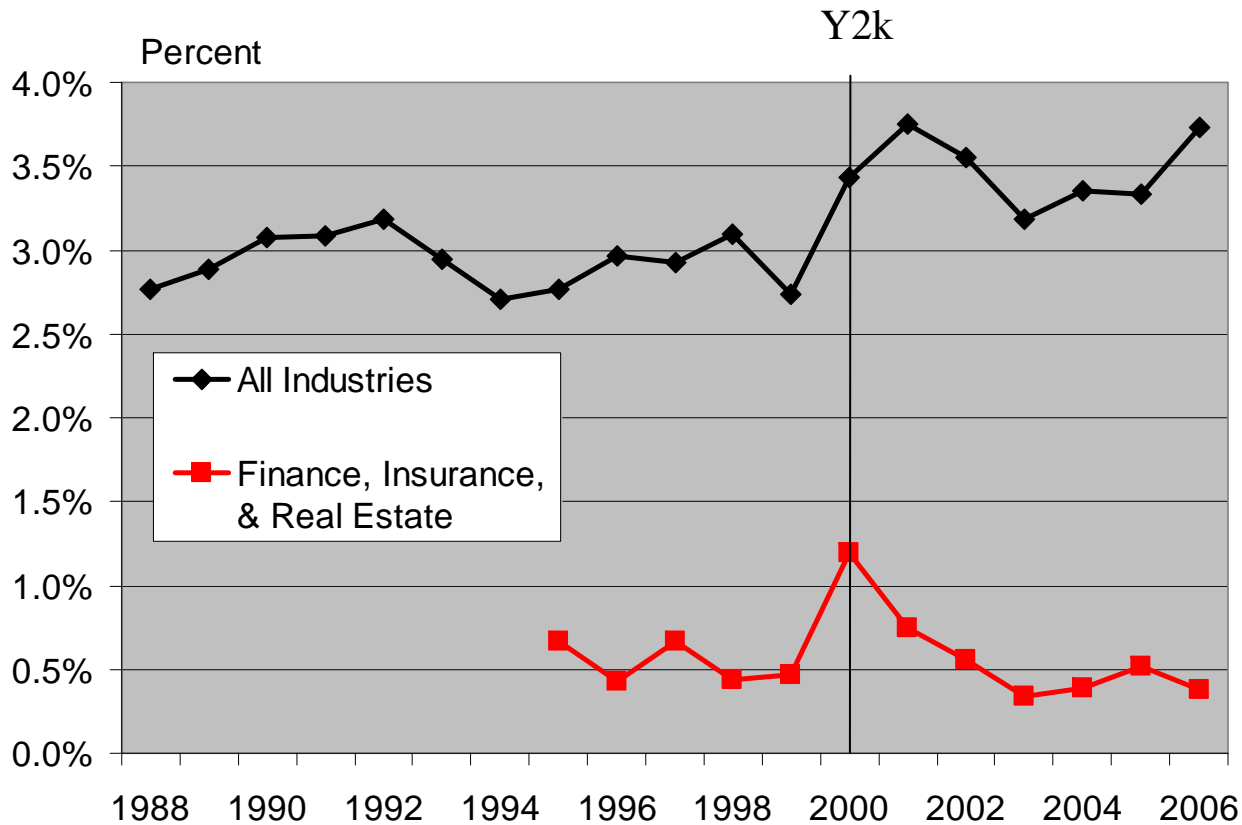
- Little systematic measurement of financial innovation
 - Counting patents is obviously problematic
 - Only a handful of papers with innovation counts in a few fields
- Measuring financial output is difficult
 - Little adjustment for quality in measures of financial output (GDP)
 - Many services are either bundled and pricing data is scarce
 - Measuring productivity growth in finance very hard
- Here we examine trends in *innovation inputs*
 - R&D spending
 - Employment of R&D workers
 - R&D *intensities*: R&D/Sales or Scientists/Workforce

Private R&D Spending (NSF)



Source: National Science Foundation, Survey of Industrial R&D

Research Intensity (R&D/Sales)



Source: National Science Foundation & Author's Calculations

By this measure, all industries are 7 times more research intensive than FIRE

Problem: Financial R&D May Go Unnoticed

- SEC requires reporting “material” amounts of R&D (1974)
 - Yet only 6 financial firms reported any R&D in 2006
 - Source: Standard & Poor’s *Compustat*
- In 20 years of financial statements of public financial firms:
 - No bank has reported positive R&D
 - 4 Insurance firms reported positive R&D; but none after 1995
 - A few securities firms/exchanges regularly report positive R&D
- R&D tax credit does not apply to financial R&D
 - Court cases say it does not satisfy the IRS definition of R&D
- NSF Measurement assumes it can locate the R&D manager
 - Financial managers don’t know where their R&D is performed
 - Financial MIS don’t track R&D or R&D workers (see above)

Much Financial R&D is Excluded by Definition

- NSF survey counts R&D performed by those trained in
 - Engineering, or one of the following:
 - Physical, Biological, Mathematical, Statistical, Computer Sciences
- NSF survey explicitly excludes Social Science R&D:

Economics (& Finance)	Actuarial Science
Management Science	Demographics
Expert Systems (A.I.)	Engineering Psychology
Marketing	R&D in Law

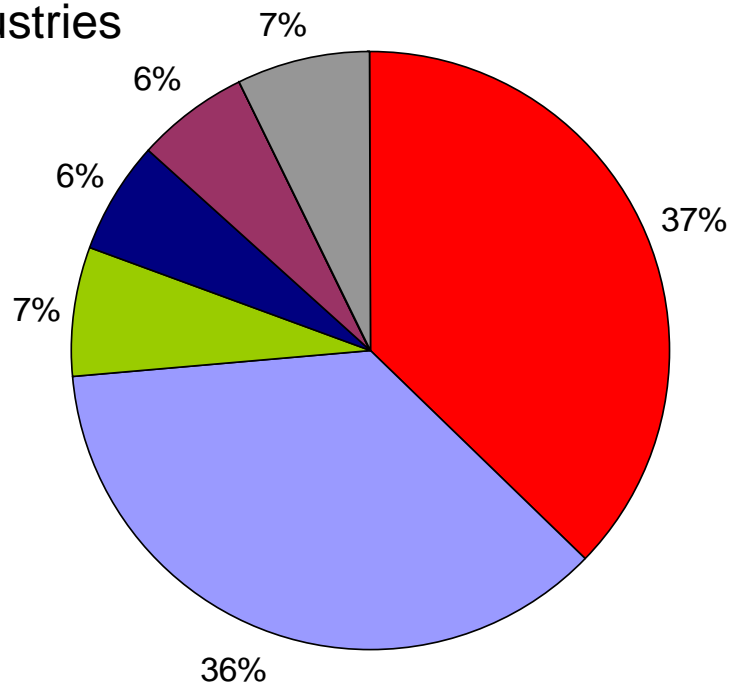
- NSF excludes *some* software development expenditures
 - Programs intended for within company use only
 - Still, most financial R&D (58%) in NSF data is for software

An Alternative Measure: Potential R&D Workers

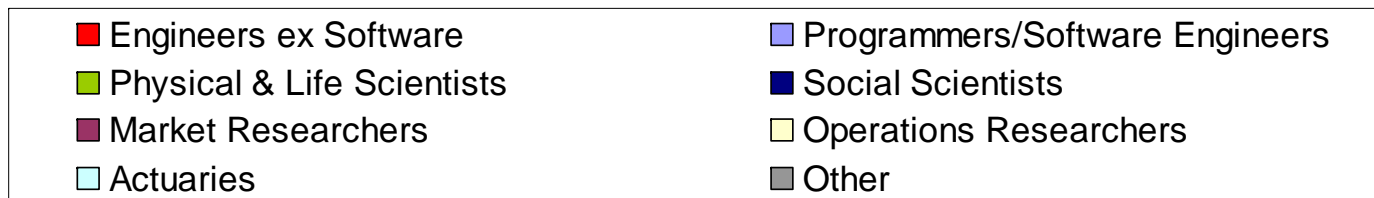
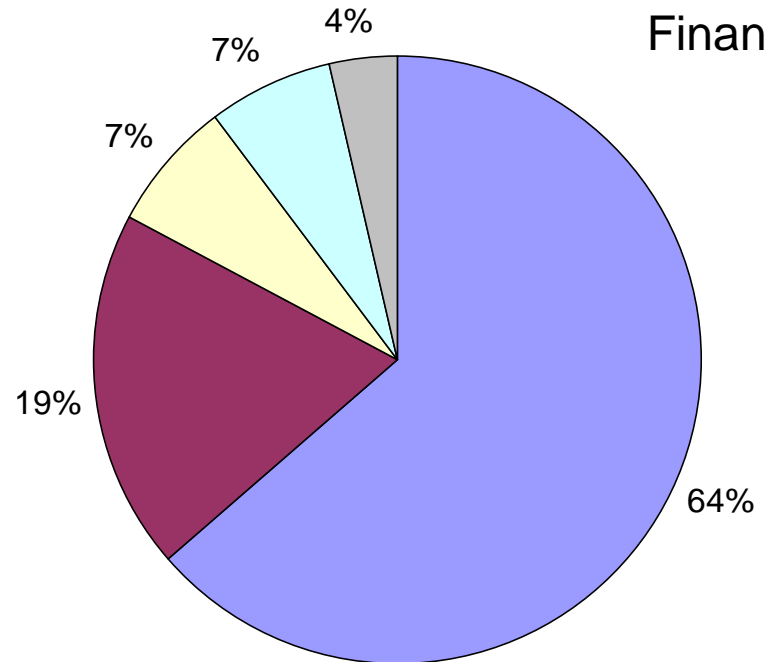
- We rely on the *Occupational Employment Statistics* (OES)
 - Produced by Bureau of Labor Statistics (BLS)
 - Assigns occupational status according to work performed
- We define a list of *potential research occupations*:
 - All physical scientists, engineers, & computer programmers
 - All social scientists, actuaries, operations researchers, market researchers, statisticians, architects, surveyors, & R&D managers
 - Excludes physicians, technicians, & teachers
- Overly inclusive by construction
 - True in all industries, not just finance
 - We compare finance relative to all industries to control for this
- We exclude real estate & holding companies from finance

Composition of Potential R&D Workers, 2006

All Industries

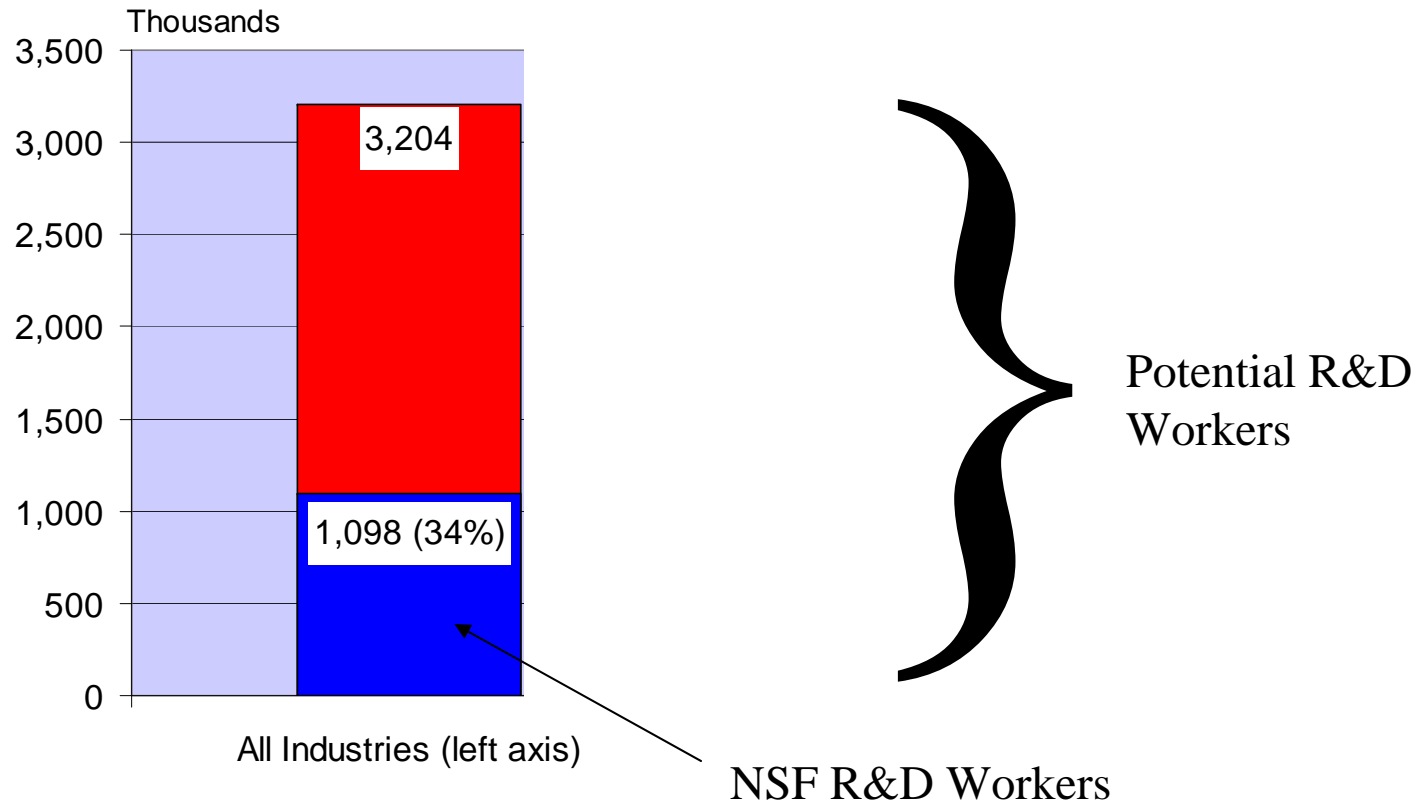


Finance



Source: Author's calculations based on data from the Bureau of Labor Statistics' Occupational Employment Statistics

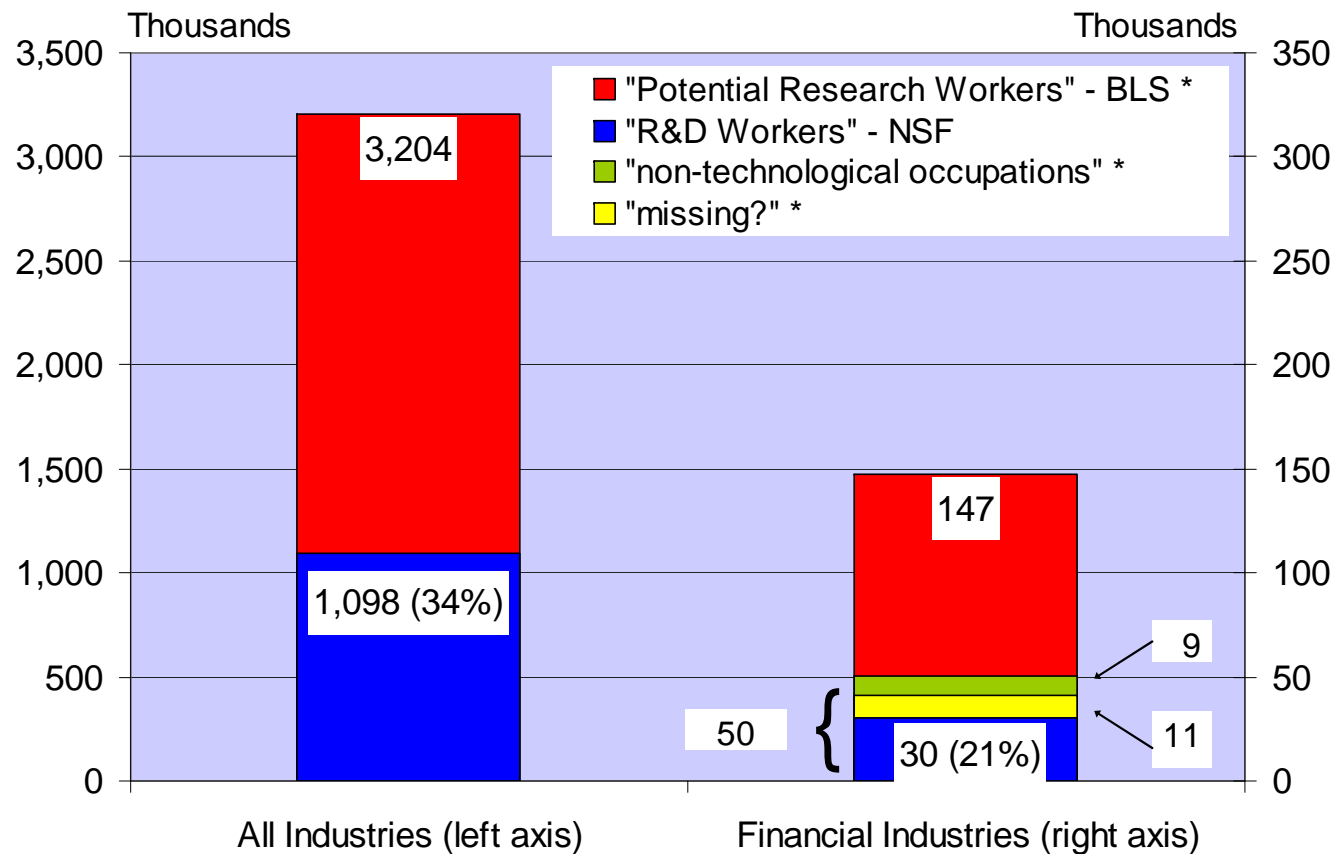
Potential vs. NSF R&D Workers, 2005*



Source: Author's calculations using data from BLS & NSF

*: See the text for the definition of potential research workers.

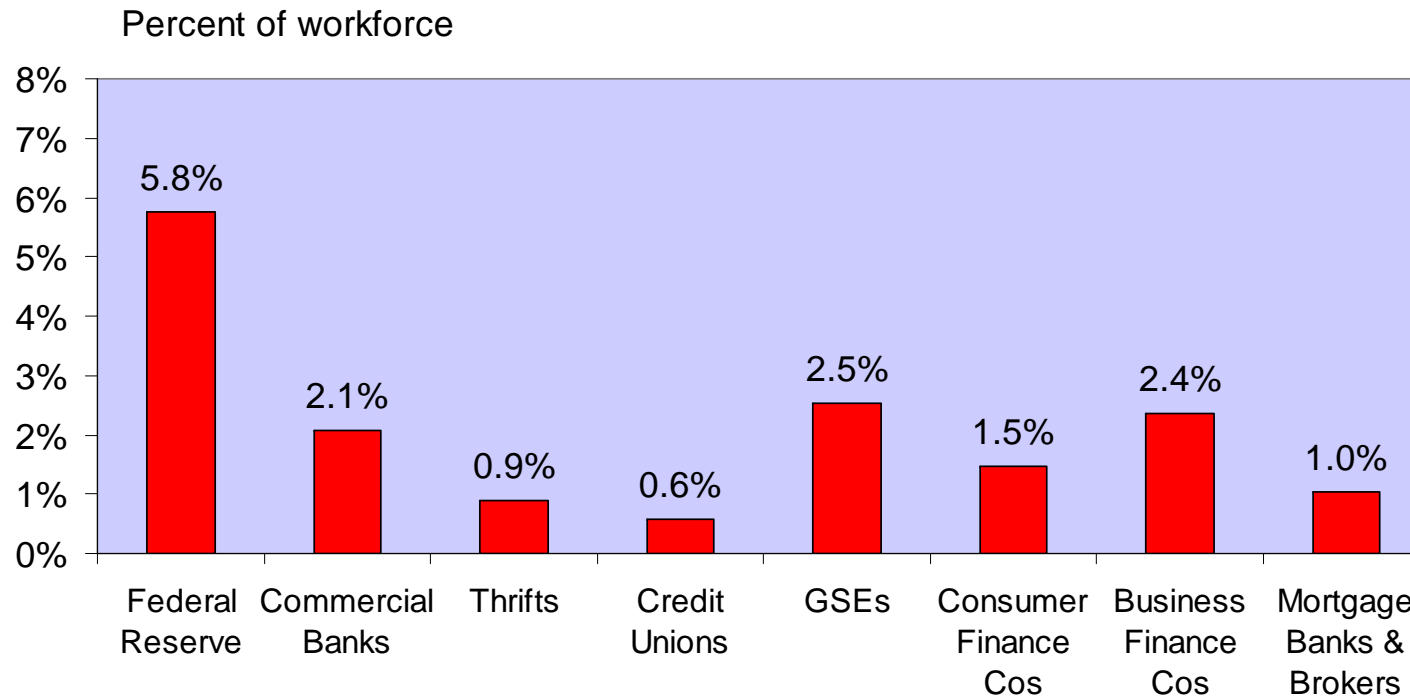
“Missing” Financial Research Workers, 2005*



Source: Author's calculations using data from BLS & NSF

*: See the text for the definition of potential research workers.

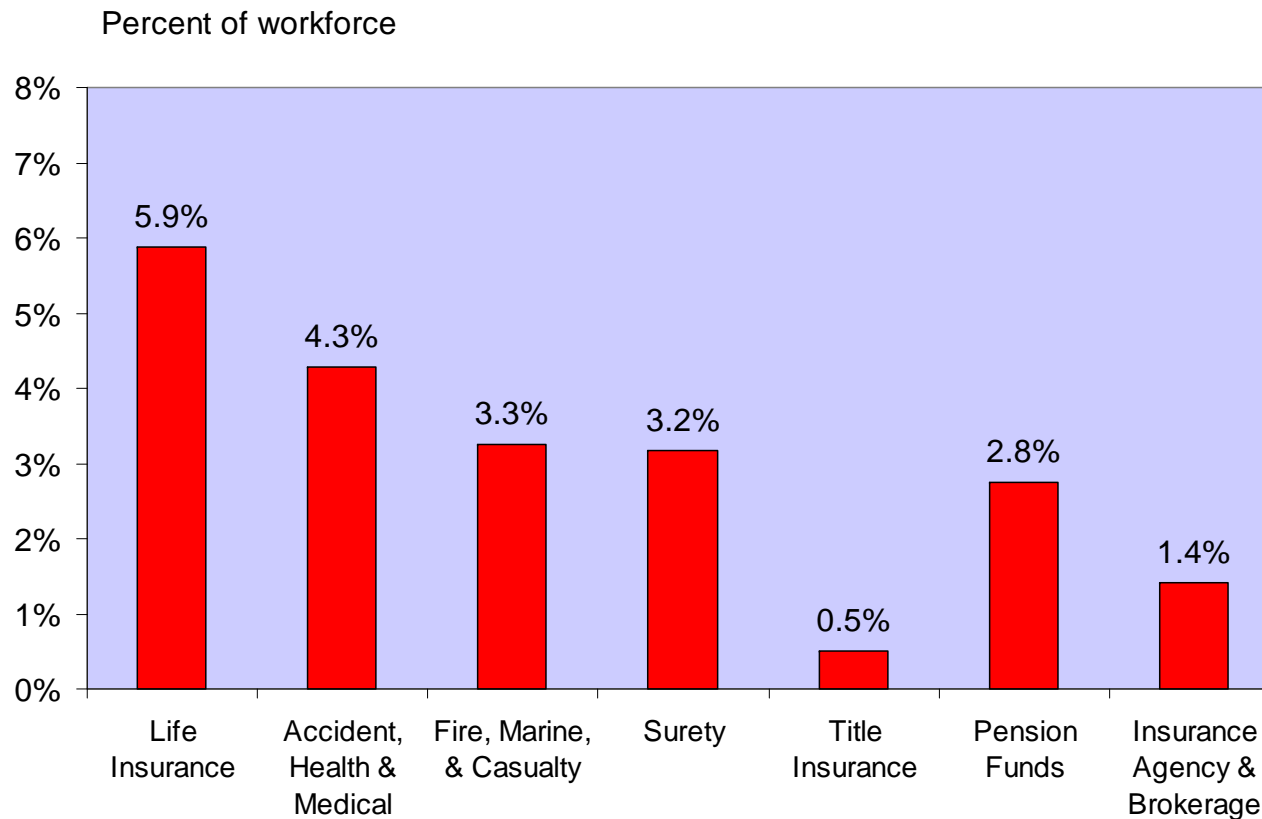
Potential Research Workers – Banking, 1990-2001*



Source: Author's calculations based on data from the Bureau of Labor Statistics' Occupational Employment Statistics

*: See WP No. 08-10 for the definition of potential research workers

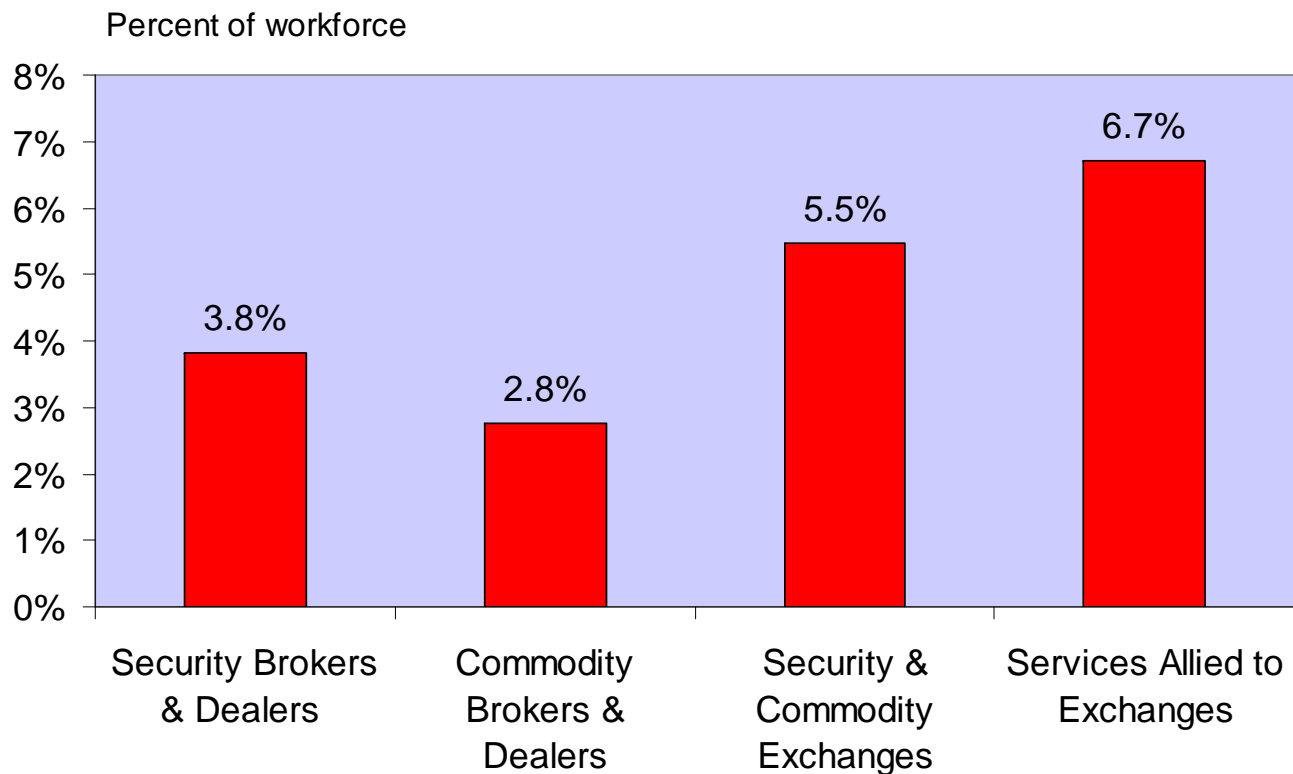
Potential Research Workers – Insurance, 1990-2001*



Source: Author's calculations based on data from the Bureau of Labor Statistics' Occupational Employment Statistics

*: See WP No. 08-10 for the definition of potential research workers

Potential Research Workers - Securities & Commodities, 1990-2001*



Source: Author's calculations based on data from the Bureau of Labor Statistics' Occupational Employment Statistics

*: See WP No. 08-10 for the definition of potential research workers

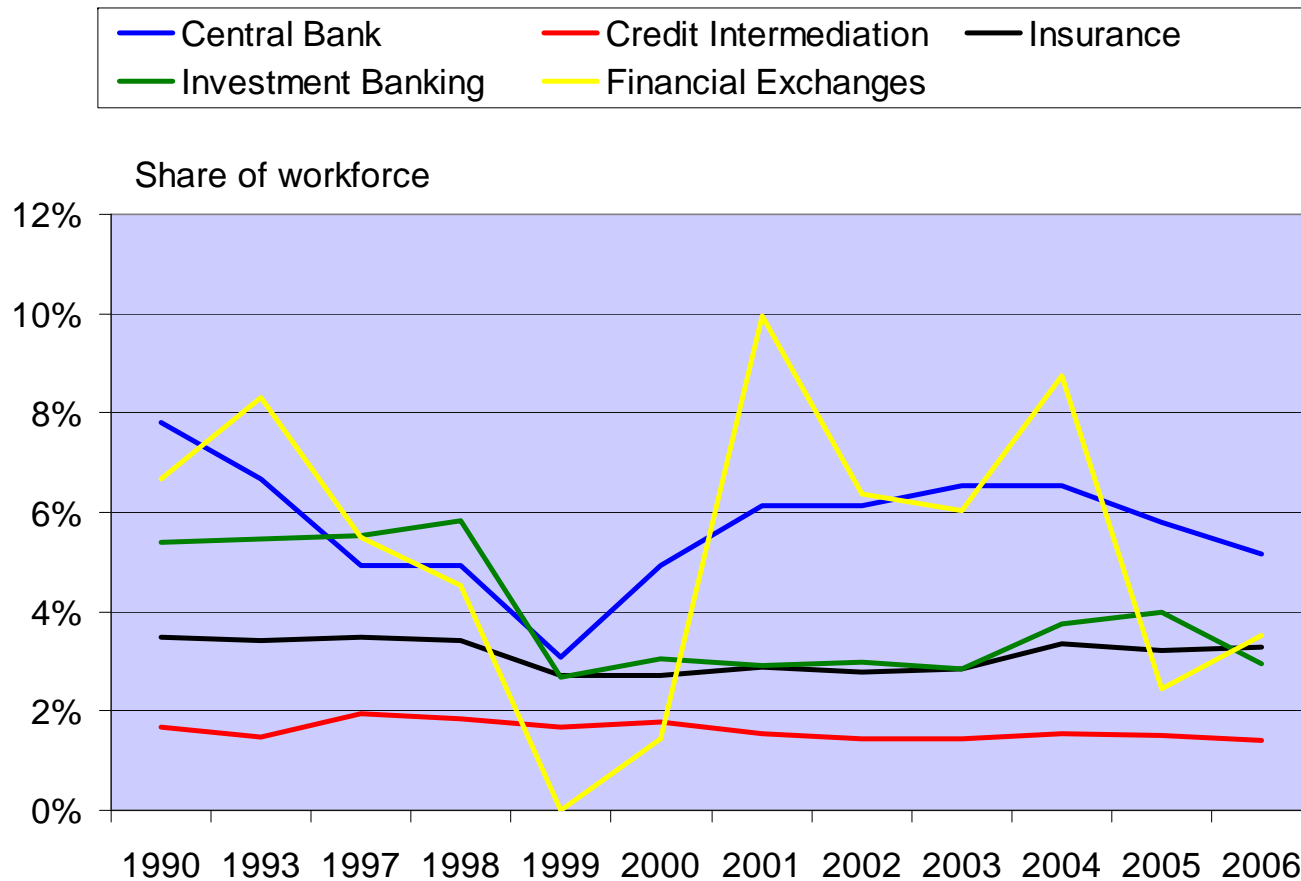
Potential Research Workers*



Source: Author's calculations based on data from the Bureau of Labor Statistics' Occupational Employment Statistics

*: See WP No. 08-10 for the definition of potential research workers

Potential Researchers by Financial Segment*



Source: Author's calculations based on data from the Bureau of Labor Statistics' Occupational Employment Statistics

*: See WP No. 08-10 for the definition of potential research workers

Caveats

- Flat R&D employment may be consistent with rising R&D
 - Firms may be increasing R&D funds per worker
 - But NSF data does not suggest much of a trend
- R&D or Scientist Intensity may not pick up increased entry
 - There could be many more performers
 - I do not have counts on the number of firms or establishments
- All measurements are at the industry, not the firm level
 - Would prefer to use firm level data for identification
- These measures do not pick up R&D from other industries
 - Location of R&D may be among input providers
 - Most business method patents are obtained by technology firms

Conclusions

- Financial R&D is significantly underestimated
 - Actual may be 66% higher than reported by NSF, due to...
 - Difficulty locating R&D performers
 - Limitations of current definitions of R&D & R&D workers
- Implied R&D/Sales ratio is about 1.3%
 - In the NSF data, it was only 0.5%
 - But still well below the ratio for all industries (3.5%)
- There is no clear trend in financial R&D intensity
 - And no evidence of a trend break
- Business method patenting is growing rapidly
 - Primarily by firms in ICT industries
 - There is considerable litigation of financial patents