# The Consequences of Financial Innovation: A Research Agenda

Josh Lerner and Peter Tufano
Harvard Business School and NBER

# Financial innovation's importance

- Claims in Miller (1986), Merton (1992).
- General purpose technology a la Bresnahan and Trajtenberg (1995) and Helpman (1998).
  - Easing capital constraints?
  - Reducing cost of capital?
    - Modeled by Michalopoulos, Laeven, and Levine (2010).
- Evidence from Tufano (1989):
  - Substantial turnover of securities issued.

# Table 1: Selected Examples of Consumer Finance Innovation, 1950-1979

| Date | Innovation |
|---|---|
| 1949 | Diner's Club travel and entertainment card |
| 1950s | Magnetic ink character recognition (MICR) technology for check reading |
| 1952 | Variable annuity life insurance (TIAA-CREF)[1] |
| 1958 | American Express and Carte Blanche travel and entertainment cards |
| 1958 | Bank Americard credit card |
| 1965 | Federally-guaranteed student loans |
| 1965 | BankAmericard creates licensing agreements with other banks (later becomes Visa) |
| 1967 | MasterCard network |
| 1970 | Credit scoring (FICO) |
| early 1970s | Automated Clearing House (ACH) debits |
| early 1970s | Automated teller machine (ATM) |
| 1970s | Securitized mortgages through structured finance mortgage pools[2] |
| 1970s | Point of sale systems for electronic payment processing (IBM)[3] |
| 1972 | Money market mutual funds |
| 1973 | Negotiable Orders of Withdrawal (NOW) accounts |
| 1974 | First MMMF to offer check writing |
| 1976 | Indexed mutual funds (Vanguard) |
| 1977 | Universal life insurance |
| late 1970s/early 1980s | Home equity line of credit |

Selected Sources:

[1] http://www.annuity-insurers.org/Resources/History/History-sec5.aspx

[2] "Asset Securitization Comptroller's Handbook 1997" In Comptroller of the Currency, Liquid and Funds Management. Washington, DC: U.S. Department of Treasury.

[3] http://www.touchpos.net/page.html?chapter=10&id=9

Source: Ryan, Trumbull and Tufano (2010)

## Table 1, cont.: Selected Examples of Consumer Finance Innovation, 1980-Present

| Date | Innovation |
|---|---|
| 1980s | Debit cards |
| 1980s | Refund anticipation loans at tax sites |
| 1980s | Adjustable rate mortgage, widespread introduction[4] |
| 1980 | Original issue deep discount bonds |
| 1983 | Collateralized mortgage obligations |
| mid 1980s | Option ARM mortgage |
| mid 1980s | Auto-title loans |
| 1984 | Fund supermarkets (Schwab) |
| 1985 | Securitized auto loans |
| 1985 | Treasury STRIPS |
| 1986 | Securitized credit cards |
| 1987 | Index-linked CDs |
| 1989 | Exchange-traded funds |
| early 1990s | Payday lending |
| early 1990s | Subprime mortgage lending (comprised .74% of mortgage market in early 1990s)[5] |
| 1990s | Electronic bill payment |
| 1992 | Online securities trading |
| mid 1990s | Prepaid cards |
| mid 1990s | Collateralized debt obligations |
| 1995 | Internet-only bank (Security First Network Bank) |
| 1999 | Online payments (Paypal) |
| late 1990s | Account aggregation services (Mint.com, Yodlee.com) |
| late 1990s | Electronic check presentment |
| late 1990s | Checking overdraft protection |
| 2000 | Mobile banking (Harris Bank)[6] |
| 2001 | Payroll cards |
| 2002 | Stored value cards |
| 2006 | Peer lending (Lending Club, Prosper) |

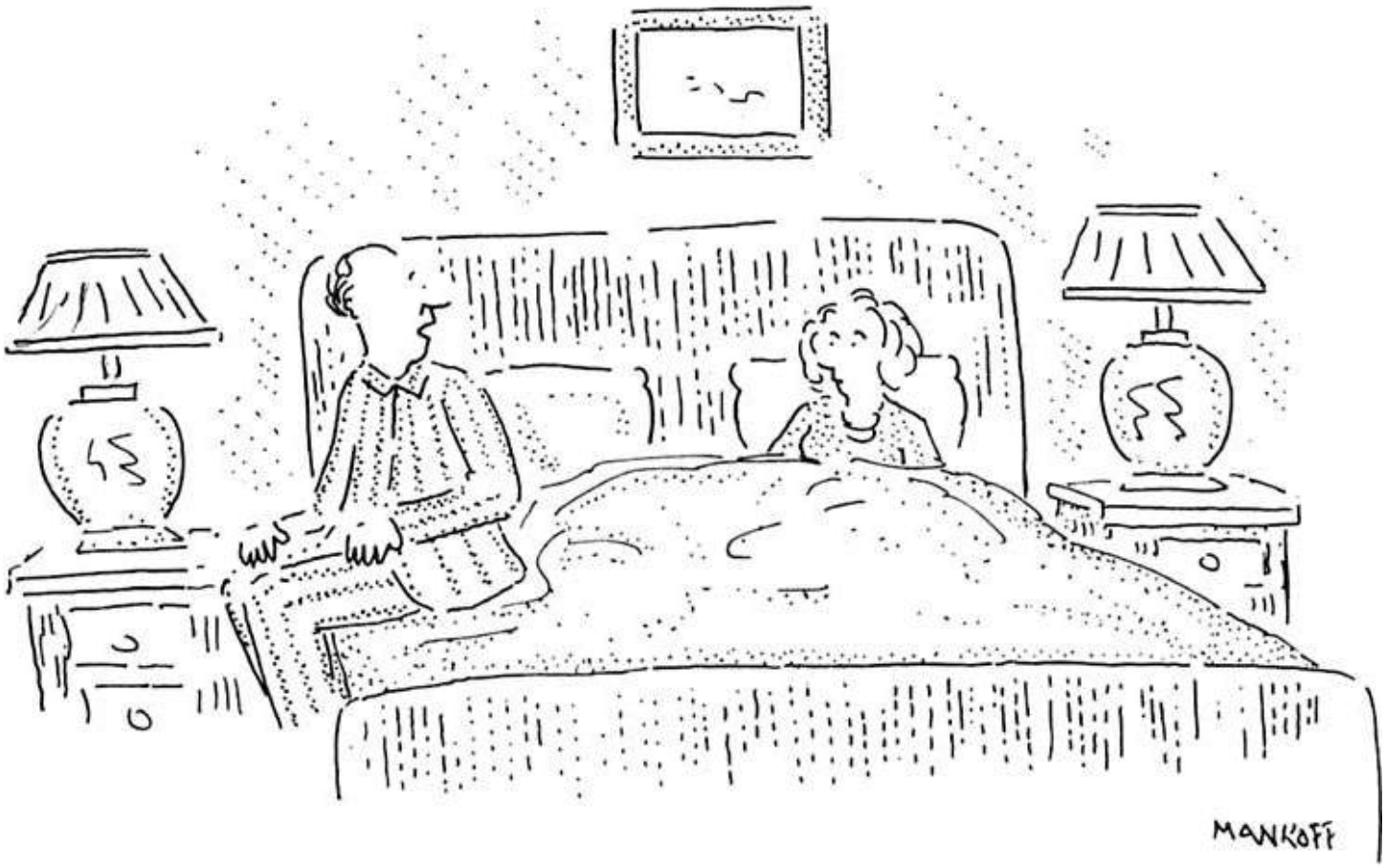
Selected Sources:

[4] Frame, W. Scott and Lawrence J. White. 2009. "Technological Change, Financial Innovation, and Diffusion in Banking." Federal Reserve Bank of Atlanta Working Paper, 2009-10.

[5] http://research.stlouisfed.org/publications/review/06/01/ChomPennCross.pdf

[6] Rob Luke and Susan S. Luke, "Mobile Banking? Hold the Phone", Bank Technology News, March 2000, 13:3

Source: Ryan, Trumbull and Tufano (2010)




*"I can't sleep. I just got this incredible craving for capital."*

# Yet relatively little empirical study

- Frame and White (2005) identify 39 empirical studies of financial innovation:
  - Contrast to 1000s on manufacturing innovation.
  - Most focused on “back end”:
    - Diffusion and consequences.
  - Only two papers on origins of innovation.
    - Despite fact that dynamics likely to be quite different.

# Particular urgency today

- Financial crisis of 2007-08:
  - Much of problem has been attributed to financial innovations:
    - [T]he innovations of recent years — the alphabet soup of C.D.O.'s and S.I.V.'s, R.M.B.S. and A.B.C.P. — were sold on false pretenses. They were promoted as ways to spread risk, making investment safer. What they did instead — aside from making their creators a lot of money, which they didn't have to repay when it all went bust — was to spread confusion, luring investors into taking on more risk than they realized.
      - Krugman [2007]
- Many recent pieces argue financial innovations have good and bad elements:
  - E.g., Johnson and Kwok (2010), Litan (2010), Mishra (2010).
- This conference!

# This paper

- How do we understand the *phenomena* of financial innovation vs. specific innovations?
- Premature to provide answers!
- Rather lay out a research agenda:
  - General observations about how financial innovation is similar/dissimilar from other innovations
  - Complementary research approach
  - Case studies of particular innovations.

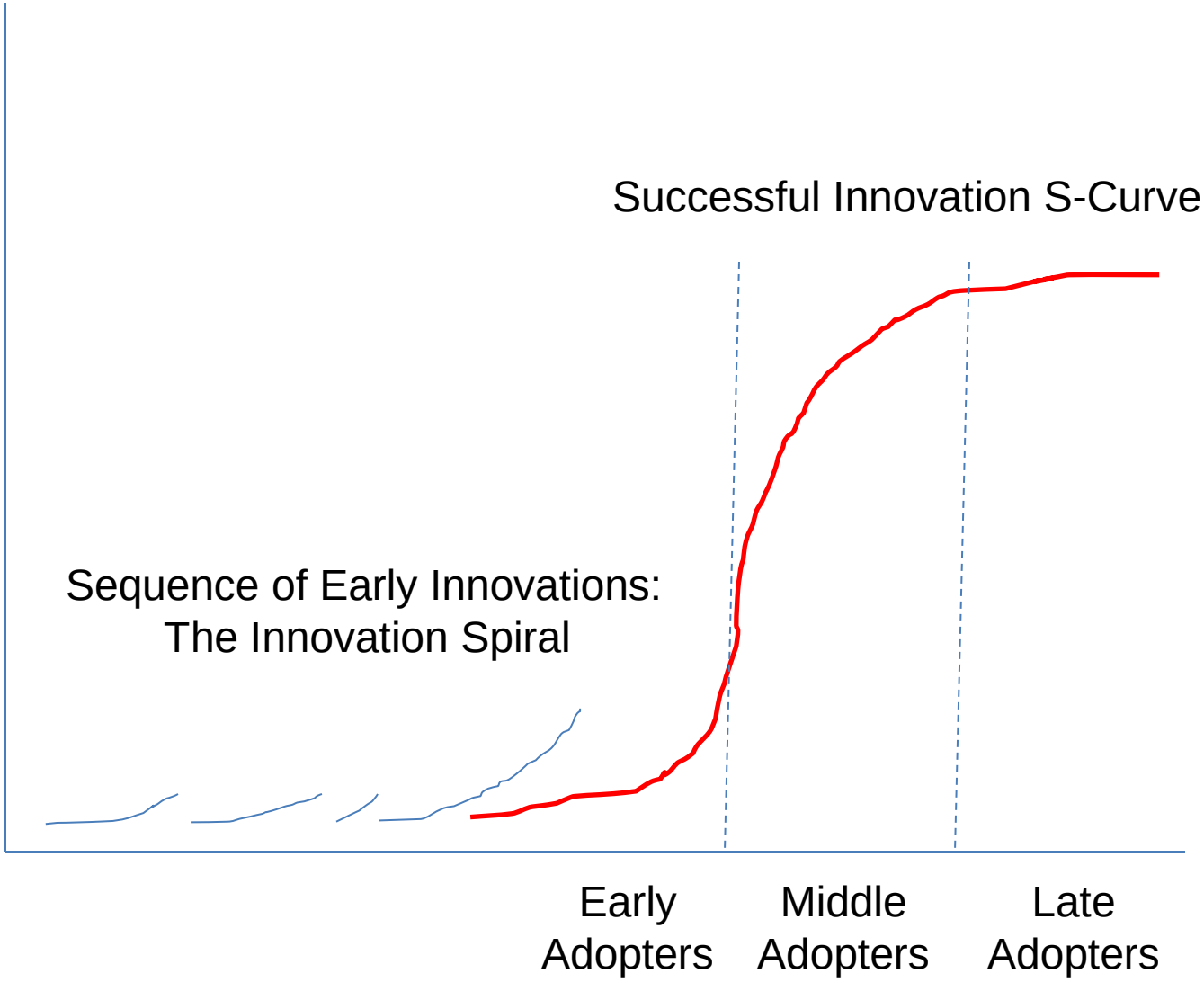
# 1. The challenge measuring social welfare

- Normal way to conceptualize social welfare:
  - Examine change in consumer surplus.
- Here, much of challenge is that social welfare impact is in the form of externalities:
  - Impact of unwitting, unexpected parties.
  - How does one think about social welfare in this context?

# 2. The interaction between regulation and innovation

- Many innovations  are functional equivalents of earlier products.
- Regulatory pressures seem to be a key driver:
  - Limited regulatory realms in particular nations.
  - “Regulatory arbitrage” across nations.

# 3. The challenge of dynamic impacts



# Implications of Dynamic Process

- Sequence of newest (failed) products
  - largely appeal to early adopters.
  - Systemic impacts likely small.
- Success S-curve adoption
  - With broader adoption comes greater systemic impacts
  - *Types of users* change over time (risk taking, innovative, knowledgeable)
  - *Manner of use* changes over time

# Implications for research methodologies

- To understand the bulk of externalities and systemic effects, should focus on *broadly diffused* innovations.
- Time series: need *long time series* to get say anything meaningful.
- Cross country studies useful, but difficult to address *endogeneity*.
- Randomized field experiments probably tell us about *early adopters*, not the full S-curve
- *No one method is ideal….need a portfolio of research approaches*

# A complementary approach: Studying Dogs that Don't Bark

- Robert W. Fogel published *Railroads and American Economic Growth* in 1964:
  - advanced a method to consider counterfactual histories.
  - In a counterfactual analysis, the researcher
    - Posits a set of plausible counterfactuals and how they might have come to pass; and
    - Evaluates metrics to establish the implications of these alternative historical paths.
- We argue this method can be used to better understand financial innovation.

# Highly contentious method

- Pros:
  - Transparent and debatable: Forces you to clearly lay out meaningful “plausible history” and dimensions along which you’d compare.
  - Can consider a long time period
  - No false precision.
- Cons:
  - Infinite degrees of freedom—can be abused.

# What research sites? Broadly adopted innovations in key spaces

| | *Households* | *Non-financial firms* | *Financial firms* |
|---|---|---|---|
| *Pooling* | Mutual funds and exchange-traded funds | Venture capital and private equity | Securitization |
| *Moving money across time and space* | | | |
| *Payments* | Card products | | |
| *Managing risk* | Retirement accounts | Derivatives | |
| *Resolving information asymmetries* | | Venture capital and private equity | |
| *Extracting information from markets* | | | Derivatives |

# Approach

- Basic history of product
- What's a plausible set of counterfactuals?
- What metrics would we use to compare the outcomes?
- Ponder long-term history and broad implications—what are tentative observations?

# Case study I: Venture capital and private equity

- Origins in 1940s:
  - Founders saw limitation of banks and public markets in addressing information asymmetries, intangible assets.
  - Widespread diffusion after U.S. relaxing of curbs on institutional investors in late 1970s and globalization of investor pool.
  - Repeated boom/bust cycle.

# Venture capital and private equity (2)

- General evidence of positive social impact:
  - Venture capital and ..
    - Innovation.
    - Firm growth.
  - Private equity and…
    - Productivity.
    - Management practices (weaker).
    - Job turnover (interpretation problematic).
    - Innovation (for subset of firms).

# Venture capital and private equity (3)

- But substantial evidence of negative impact of market peaks:
  - Much reduced private returns.
  - Excessive leverage.
  - Dramatically higher rates of bankruptcy of portfolio firms.
  - Negative impact on competitive firms.
    - Unfortunately bulk of funding in these periods!

# Counterfactual approach

- Three plausible alternatives to venture financing:
  - Angel investors.
  - Government funding.
  - Integrated financing.
- Might think each would be plausible substitute.

# Metrics?

- Cost of funds
- Number of start ups
- New products created?  Social value of products?
- Jobs created?

# Observation/hypothesis

- But in each case, empirical (and in many cases, theoretical literature) suggests counterfactuals would have had substantial limitations relative to actual path of innovation.

# Case study II: Mutual funds

- Origins of open-end funds in 1920s.
  - Pooled investment vehicles.
  - Shares bought and sold at net asset value.
- Further innovation in 1970s:
  - Muni market, muni bond, etc.
  - Proliferation of index funds.
- Exchange traded funds in 1970s.

# Impact on the US Household Sector

| Composition of US Household Financial Market Assets 1950 and 2008 | | | |
|---|---|---|---|
| | | | |
| | **1950** | **2008** | **Gain/Loss** |
| | | | |
| Bank-system deposits | 28.1 | 18.2 | -9.9 |
| Money Market Mutual funds | 0.0 | 4.5 | 4.5 |
| Direct holdings stocks and bonds | 51.1 | 29.0 | -22.1 |
| Mutual funds | 0.7 | 10.0 | 9.3 |
| Pension Reserves | 5.2 | 30.4 | 25.2 |
| Other | 14.9 | 7.9 | -7.0 |

# What are the counterfactuals?

- Continuation of 50's style investing: banks, bank trust departments, direct ownership of stocks, investment/insurance products
- Development of new, probably opaque institutions that provide investment services
- Radical or miraculous innovations: fractional shares

# Metrics

- Fees and costs
- Returns and risk
- Wealth levels
- Development of public markets
- Knock-on implications: DC plans, competition, regulatory oversight

# Evaluation along various dimensions

- Lower cost than many intermediated schemes
- While perhaps dominated by index funds and ETFs, likely substantially better than direct investing.
- Would not have gotten ETFs or Index Funds without introduction of funds
- Likely enhancement of public markets—and positive pressure on returns
- Role in development of DC plans
- Role in greater household risk bearing
- Greater competition on banking sector;  reduced role of banks and perhaps authority of regulators

# Case Study III: Securitization

- Goes back at least to the 1920s, but widespread in 1970s and 1980s.
- Pass Through MBS: Ginnie Mae in 1970
- Tranched Structures: Freddie Mac in 1983
- Expansion of assets:  Auto loans (1985), credit cards (1986)
- Even more complex structures:  CLOs, CDOs, synthetic CDOs, CDO-squared

# Elements of Securitization

- *Bundling* of loans from single or multiple lenders
- Selection of underlying assets
- Standardization of assets and terms
- Guarantees and/or credit enhancement
- Tranching
- *Unbundling* of functions:  Separate and specialized originators, servicers, investors

# Counterfactuals

- Depositories or original lenders continue to originate and hold loans.
- Securitization exists, but only in the form of MBS-like structures (pooling but no tranching)
- “Simple” tranching, but not more complex products (synthetic CDOs or CDO-squared)

# Metrics

- Availability of credit
- Cost of credit
- Resultant change in economic activity (homeownership)
- Unintended consequences (sloppy underwriting standards, “excess” leverage in HH sector, opaque and poorly understood investments, etc.)

# Observations

- Compared with first counterfactual, first waves of securitization (pass throughs) demonstrate positive evidence of benefits: lower cost financing, greater availability
- Subsequent diffusion to mid and late adopters, and change in product structure and assets more problematic
- To when would we like to have rolled back the clock?  Which counterfactual?

# “Conclusion”

- We know remarkably little about empirical implications of financial innovation as a general phenomenon.
- No one research method is adequate
- Counterfactuals, while fuzzy, can help us focus the debate:
  - Which innovations should we study?
  - What counterfactual history is plausible?
  - Which metric should we use?

# What type of research?

- Focus on adoption and diffusion patterns
- Changes in characteristics of adopters, visible changes in products, changes in how products are used.
- Long-term, broad implications as well as narrow more measurable metrics.

# Research directions

- Behavior of financial markets when innovations are barred.
- Classic case is Islamic finance:
  - Prohibitions on interest, multiple equity classes, etc.
  - Particularly as interpreted in Saudi and Gulf.
- This may provide a “natural experiment” for gauging impact of innovation.