The Consequences of Financial Innovation: A Research Agenda

Josh Lerner and Peter Tufano
Harvard Business School and NBER
Financial innovation’s importance

• 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

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

Selected Sources:

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

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

Selected Sources:


\(^5\) http://research.stlouisfed.org/publications/review/06/01/ChomPennCross.pdf


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:

• 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

Sequence of Early Innovations: The Innovation Spiral

Successful Innovation S-Curve

Early Adopters  Middle Adopters  Late Adopters
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

<table>
<thead>
<tr>
<th></th>
<th>Households</th>
<th>Non-financial firms</th>
<th>Financial firms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pooling</strong></td>
<td>Mutual funds</td>
<td>Venture capital and private equity</td>
<td>Securitization</td>
</tr>
<tr>
<td><strong>Moving money across time and space</strong></td>
<td>Mutual funds and exchange-traded funds</td>
<td>Venture capital and private equity</td>
<td></td>
</tr>
<tr>
<td><strong>Payments</strong></td>
<td>Card products</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Managing risk</strong></td>
<td>Retirement accounts</td>
<td></td>
<td>Derivatives</td>
</tr>
<tr>
<td><strong>Resolving information asymmetries</strong></td>
<td>Venture capital and private equity</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Extracting information from markets</strong></td>
<td></td>
<td></td>
<td>Derivatives</td>
</tr>
</tbody>
</table>
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.
  – 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

<table>
<thead>
<tr>
<th>Asset</th>
<th>1950</th>
<th>2008</th>
<th>Gain/Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank-system deposits</td>
<td>28.1</td>
<td>18.2</td>
<td>-9.9</td>
</tr>
<tr>
<td>Money Market Mutual funds</td>
<td>0.0</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Direct holdings stocks and bonds</td>
<td>51.1</td>
<td>29.0</td>
<td>-22.1</td>
</tr>
<tr>
<td>Mutual funds</td>
<td>0.7</td>
<td>10.0</td>
<td>9.3</td>
</tr>
<tr>
<td>Pension Reserves</td>
<td>5.2</td>
<td>30.4</td>
<td>25.2</td>
</tr>
<tr>
<td>Other</td>
<td>14.9</td>
<td>7.9</td>
<td>-7.0</td>
</tr>
</tbody>
</table>
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.