Workshop on the Financial Economics of Insurance
Background on Insurance[1]

Ralph S.J. Koijen[a] Motohiro Yogo[b]

[a]University of Chicago, Booth School of Business, NBER, and CEPR

[b]Princeton University and NBER

[1]Based upon work supported by NSF grant 1727049.

Motivation for this course

- Insurance is an active field at the intersection of finance, IO, public economics, and health economics.
- Lots of research on health insurance based on Rothschild and Stiglitz (1976).
- The goal of this course is
  1. To draw attention to large share of the insurance sector that is not health insurance.
  2. To develop a unifying framework to think about both supply and demand in insurance markets.
- Funded by NSF grant 1727049 and Bendheim Center for Finance.
- insurance.princeton.edu: Teaching notes, reading list, and links to insurance data.

What is insurance?

- A financial contract that promises payment conditional on an event in exchange for an upfront premium.
- Key characteristics:
  1. Type of event:
     - Idiosyncratic: Accident and health events, death, and life expectancy of an individual.
     - Systematic: Secular shocks to life expectancy, interest rates, and stock market.
  2. Maturity: How long does the contract last?

Short- vs. long-term insurance

- Short-term insurance is closer to a pure state-contingent contract.
  - Auto, homeowner's, and health insurance.
- Long-term insurance is a bundle of a state-contingent contract and a savings product. The idea is that premiums are accumulated over time, invested in financial assets, and eventually paid out.
  - Annuities, term-life insurance, and long-term care insurance.
- Long-term insurance generally provides better insurance (against reclassification risk).
- However, policyholders bear systematic risk of changes in loss probabilities and investment returns.

What is an insurance company?

- An intermediary that facilitates pooling of risks.
  - Search frictions in product market.
  - Expertise in asset allocation and risk management.
- Is insurance an increasing returns industry?
  - LLN implies that larger pools are better for risk diversification.
  - Diversification across product lines such as annuities vs. life insurance, flood vs. earthquake insurance, etc.
  - Product market: Brand name, marketing, and broker networks.
- Some diversification accomplished through reinsurance (i.e., sharing of risks between insurance companies).

Ownership structure

1. Mutual companies.
   - Policyholders are also equity holders, bearing risk of changes in loss probabilities and investment returns.
   - Alignment of incentives.
2. Stock companies.
   - Policyholders are debt holders.
   - Outside equity holders bear risk of changes in loss probabilities and investment returns.
   - Access to external finance facilitates growth, especially into new markets.
   - Incentives of equity holders may not be aligned with policyholders.

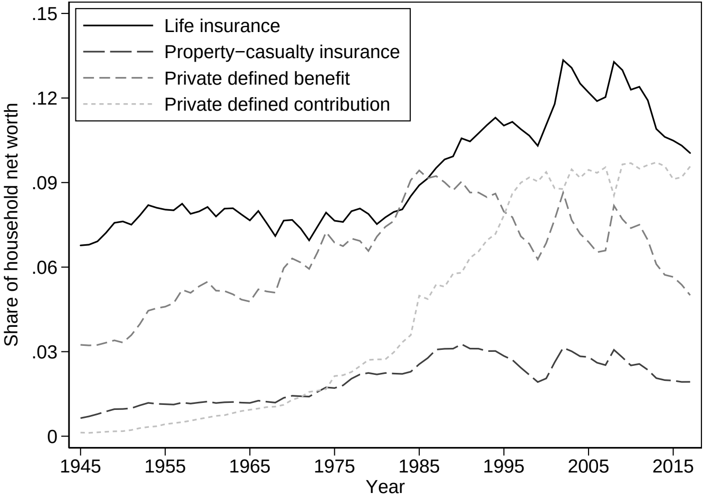
Important economic functions of insurers

1. Diversify most important sources of idiosyncratic risk.
   - Life insurers: Annuities, life insurance, and accident and health.
   - Property-casualty insurers.
2. Smooth aggregate risk over time (intergenerational risk sharing).
   - Replacing defined-benefit plans and Social Security.
3. Tax efficient investing.
4. Provide long-term stable funding for macro investment and growth.
   - Largest institutional owners of corporate bonds.

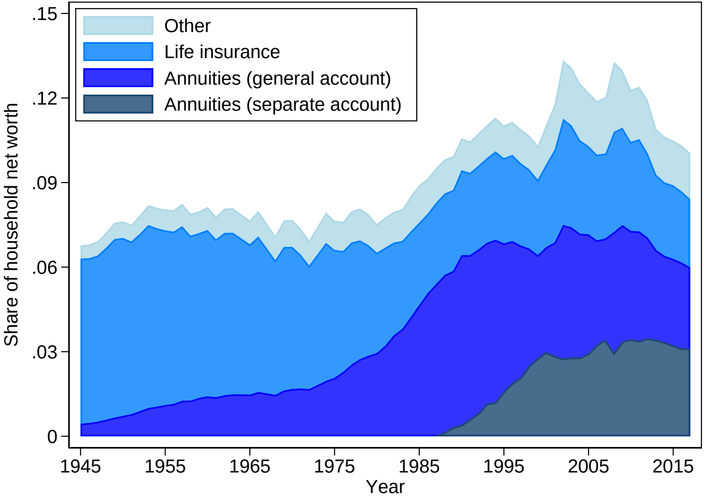
Theories of insurance markets

1. Demand-side theories of idiosyncratic risk.
   - Yaari (1965): Life-cycle theory.
   - Rothschild and Stiglitz (1976): Informational frictions.
2. Demand-side theories of aggregate risk.
   - Dumas (1989): Efficient risk sharing of aggregate risk with heterogeneous risk preferences.
   - Allen and Gale (1997): Intergenerational risk sharing.
3. Supply-side theories with financial frictions and market power.
   - Gron (1990) and Froot (2007): Catastrophe insurance.
   - Koijen and Yogo (2015, 2016, 2017): Annuities and life insurance.

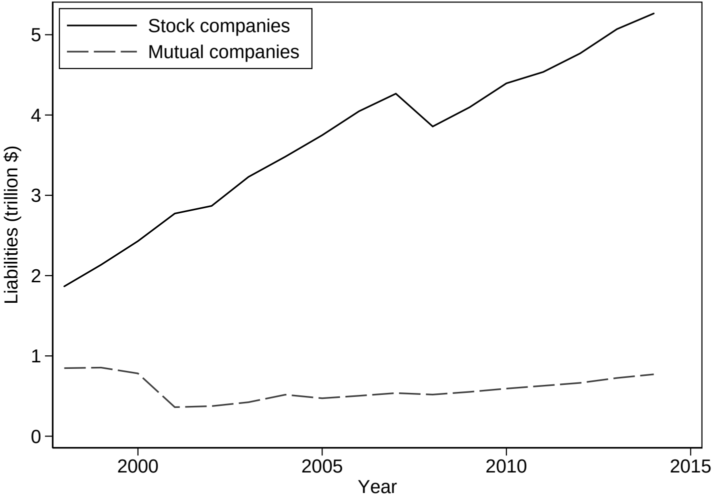
Insurance and pension fund liabilities



Composition of life insurer liabilities



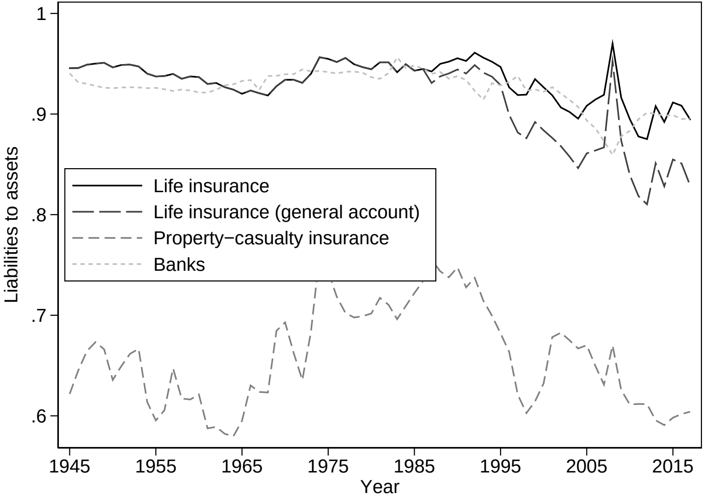
Life insurer liabilities by ownership type



Transformation of insurance liabilities

- Growth of life insurer liabilities since 1980s.
  - Private retirement solution: Coincides with the growth of defined-contribution plans relative to defined-benefit plans.
- Changing composition from life insurance to annuities, especially in the separate account.
- Variable annuities are a bundle of mutual funds (in the separate account) and minimum return guarantees (in the general account).
- Growth entirely from stock companies.
  - Extensive margin: De-mutualization.
  - Intensive margin: Stock companies focus on non-traditional products like variable annuities.

Leverage of life and property-casualty insurers



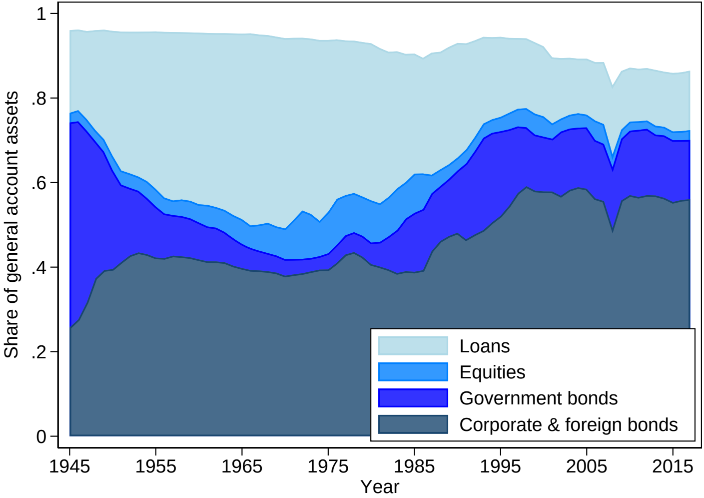
Leverage of life insurers

- Nearly constant until 1980s, consistent with the nature of traditional business.
- Declining and more volatile since 1980s due to modern liabilities that are harder to manage.
- Grain of salt: Leverage based on US balance sheets alone may be misleading as global insurers could move leverage offshore.
- Secular decline in leverage similar to banking.
- Reasons for high leverage in banking also apply to insurance.
  - Taxes: Insurance premiums are tax deferred.
  - Insurance liabilities cheaper than market debt because of guaranty funds.
  - Moral hazard due to guaranty funds and other agency problems.

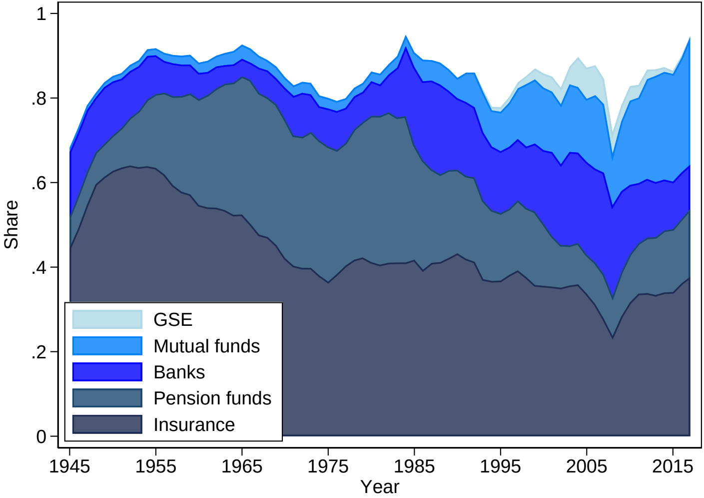
Leverage of property-casualty insurers

- Much lower and more volatile leverage.
- Underwriting cycles (Gron 1994, Froot and O'Connell 1999).
  - A large loss wipes out internal capital, and external capital doesn't flow in immediately.
  - Higher leverage coupled with higher prices and lower quantities.
- Recent issues:
  1. New sources of capital such as hedge funds, pension funds, and sovereign wealth funds.
  2. Local regulation limits global capital flows.
  3. "Insurance-innovation loop" for new risks such as cyber security.
     - Insurers unwilling to underwrite policies because distribution of risks is unknown.
     - Firms unwilling to adopt new technologies that cannot be insured.

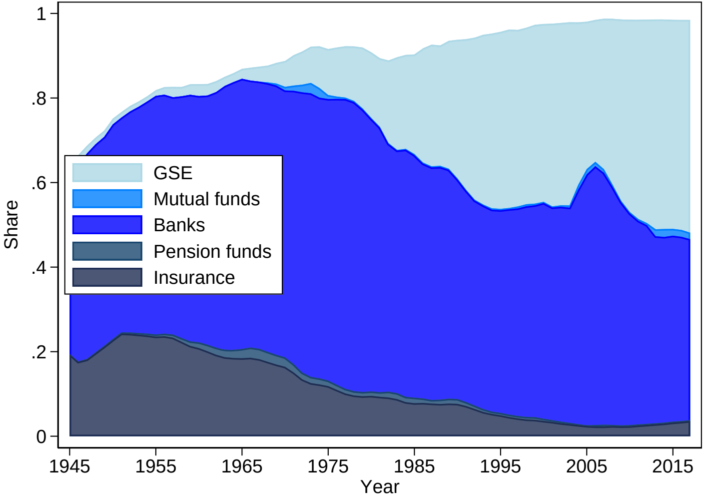
Composition of general account assets



Institutional ownership of corporate and foreign bonds



Institutional ownership of mortgages



Asset management

- Have always been a major player in the corporate bond market.
- Substitution from loans to securities since the 1980s.
- Modern insurers use derivatives for risk management.
- Also sophisticated forms of leverage.
  - Shadow insurance (Koijen and Yogo 2016).
  - Securities lending (Foley-Fisher et al. 2016).

Institutions

- Insurance regulated at the state level, firmly established by McCarran-Ferguson Act of 1945.
- National Association of Insurance Commissioners (NAIC) founded in 1871.
  - Coordinates product, accounting, and capital standards.
- State guaranty associations, first established in New York in 1941.
  - Like deposit insurance that protects policyholders in case of default.
  - Works through ex-post assessments on surviving companies.
- Rating agencies: A.M. Best Company, Moody's, and S&P.

Regulation

- Accounting standards differ between state (statutory accounting principles) and global (GAAP).
- Risk-based capital important for both regulators and rating agencies.
- However, lots of gaps and inconsistencies across states and countries.
  - Problematic for risk monitoring of (global) insurers.
  - Great for identification!
- European Union: Solvency II attempts to make reporting and capital standards uniform across countries.

Data

1. U.S. financial statements filed with the NAIC. In addition to balance sheets,
   - Schedule D: Security holdings.
   - Schedule DB: Derivatives.
   - Schedule S: Reinsurance.

   Cleaned up versions available through A.M. Best and SNL Financial.
2. Financial statements for European (Solvency II) and global insurers available as separate products from A.M. Best.
3. Insurance prices.
   - Compulife Software: Term life and universal life insurance.
   - WebAnnuities Insurance Agency: Term and life annuities.
   - Morningstar Annuity Intelligence: Variable annuities.
   - Weiss Ratings: Medigap and long-term care insurance.

Data

4. Security holdings.
    - Thomson Reuters eMAXX: Global bond holdings.
    - ECB Securities Holdings Statistics: Complete security holdings of euro-area institutions including insurance companies.
5. Other useful sources.
    - Fed: Financial Accounts of the United States.
    - LIMRA.