Post-Retirement Benefit Plans, Leverage, and Real Investment

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Motivation

- Post-retirement plans are economically important
  - Pension fund assets are 72% of GDP in OECD countries
  - Particularly large in Netherlands, Austria, the United Kingdom and the United States
  - Currently, reforms in many countries
    - Shift away from PAYG to funded arrangements
    - Defined contribution (DC) instead of defined benefit (DB)
  - Different types of benefits
    - Pensions, Medical plans, Insurance coverage
    - Other welfare benefits
      - Tuition assistance
      - Day care
      - Legal services
      - Housing subsidies provided after retirement

Objective

- Consider DB post-retirement plans from a corporate perspective
  - Investigate effect on liability side (i.e. leverage) and asset side (i.e. real investment)
    - DB plan assets and liabilities are off-balance sheet
      - Analyze effect of consolidating DB plans on balance sheet
    - Post-retirement obligations have more flexible terms than regular debt
      - Investigate the effect of financial flexibility on real investment
  - 33,000 publically traded non-financial firms from 50 countries during the period 2002-2009

Post-Retirement Benefits

- Periodic contributions go through income/cash flow statement
- Assets and liabilities are treated as off-balance sheet items
  - Balance sheet only shows net amount (plus possibly other items)
- Disclosure
  - Fair value of plan assets
  - Projected benefit obligations (PBO), Accumulated benefit obligation (ABO), Defined benefit obligation (DBO), Expected benefit obligation (EBO)
  - FAS 87 and 88 (1985), FAS 106 (1990), FAS 132 (1998, 2003), FAS 158 (2006)
  - IAS 19 (1983, 1998, 2000, 2002)
- Robustness
  - Fixed effects for countries, years, accounting standards
  - Subsample of U.S. GAAP and IAS compliant firms
  - Subperiod analysis (pre/post 2006, by year)

Leverage

- PBO are legal obligations of the firm
  - May be senior to other claims
  - Can trade off other forms of compensation against retirement benefits
- Consolidate post-retirement plans on the balance sheet
  - Remove existing items
  - Add DB plan assets and liabilities
    - Shivdasani and Stefanescu (RFS 2010)
    - Campbell, Dhaliwal and Schwartz (RFS 2011), Jin, Merton and Bodie (JFE 2006), Franzoni and Marin (JF 2006), Coronado and Sharpe (BP 2003), Barth, Beaver and Landsman (JAE 1992), Barth (1991), Landsman (1986)
  - Rating agencies also do this in various forms
  - Provides potential explanation for the low levels of observed leverage (Graham, JF 2000)

PBO vs. Regular Debt

- Also differences between post-retirement obligations and regular debt
  - Governments or industry associations may provide additional insurance schemes
    - Pension Benefit Guaranty Corporation (US)
    - Pension Protection Fund (UK)
  - Pension assets cannot be easily liquidated to cover other corporate liabilities
  - Monitoring by employees may be less effective
  - Level and timing of contributions is more flexible than with payments to service regular debt
  - More discretion with regards to valuing the obligation
- No perfect substitutability between PBO and regular debt

Regular and Consolidated Leverage

		Consolidated	Regular	Difference	Test	
	N	Mean	Mean	Means	t-Test	Wilcoxon
TotalDebt / TotalAssets	38,387	0.317	0.257	0.060	[0.00]	[0.00]
LongTermDebtAndPreferredStock / TotalAssets	35,481	0.245	0.180	0.065	[0.00]	[0.00]
LongTermDebt / TotalAssets	35,311	0.241	0.176	0.065	[0.00]	[0.00]
TotalDebt / SizeMarketValue	37,024	0.367	0.302	0.065	[0.00]	[0.00]
LongTermDebtAndPreferredStock / SizeMarketValue	34,266	0.270	0.197	0.073	[0.00]	[0.00]
LongTermDebt / SizeMarketValue	34,101	0.267	0.193	0.073	[0.00]	[0.00]

- Off-balance sheet post-retirement plans increase effective leverage by 32% on average
  - Difference is always positive, but not statistically significant in about half of 36 countries
  - Difference large in countries where defined benefit plans are most important and frequent
- Traditional measures significantly underestimate effective leverage of corporations!

Multivariate Analysis

	Regular Leverage		Consolidated Leverage	
	Coef	*p*-value	Coef	*p*-value
PBO/Total Assets	**-0.227**	**[0.00]**		
Post-Retirement Benefit Plan			**0.062**	**[0.00]**
Market-to-Book	0.006	[0.00]	0.007	[0.00]
Volatility of ROA (log)	-0.011	[0.00]	-0.008	[0.00]
…				
Adjusted R^2	0.32		0.32	
Observations	32,854		32,854	

- Firms reduce their level of regular debt by only 23 cents for each dollar of projected benefit obligation.

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- Firms reduce their level of regular debt by only 23 cents for each dollar of projected benefit obligation.
- Overall, plan sponsors have higher total leverage by 24% (6% of total assets) compared to similar firms without post-retirement plan.
  - Plan sponsors have 40-60% more leverage compared to non-sponsors in some countries such as the UK

Substitution Rates By Country

	Regular Leverage		
		H_0=0	H_0=-1
	Coef	*p*-value	*p*-value
Denmark	0.243	[0.39]	[0.00]
Malaysia	-0.016	[0.95]	[0.00]
South Africa	-0.079	[0.17]	[0.00]
Japan	-0.144	[0.00]	[0.00]
Switzerland	-0.171	[0.00]	[0.00]
United Kingdom	-0.195	[0.00]	[0.00]
United States	**-0.226**	**[0.00]**	**[0.00]**
Australia	-0.270	[0.00]	[0.00]
Netherlands	-0.274	[0.00]	[0.00]
Canada	-0.283	[0.00]	[0.00]
Sweden	-0.305	[0.00]	[0.00]
Germany	-0.398	[0.00]	[0.00]
France	-0.533	[0.00]	[0.00]
Finland	-0.612	[0.00]	[0.06]
Austria	-0.647	[0.04]	[0.25]
India	-0.671	[0.00]	[0.03]
Indonesia	-0.672	[0.00]	[0.14]
Hong Kong	-0.747	[0.00]	[0.16]
Norway	-0.793	[0.00]	[0.44]
Taiwan, Province Of China	-1.094	[0.00]	[0.54]

Empirically, substitution rates range between

0 (no substitution) and

-1 (perfect substitution)

across all countries.

Substitution Rate by Country Characteristic

	Country Characteristic	
	High	Low
Labor Market		
Employment Protection	**-0.486**	**-0.218**
Employment Laws	**-0.368**	**-0.214**
Labor Market Freedom	**-0.218**	**-0.307**

- Substitution rates are higher in countries with
  - better employment protection
  - better protection of labor and employment laws
  - less labor market freedom

Substitution Rate by Country Characteristic

	Country Characteristic	
	High	Low
Rule of Law and Debt Markets		
Rule of Law	**-0.216**	**-0.300**
Private Bond Market Capitalization/GDP	**-0.202**	**-0.249**
Private Credit/GDP	**-0.213**	**-0.341**
Pension System		
Net Replacement Rate	**-0.271**	**-0.221**
Pension Fund Assets/GDP	**-0.220**	**-0.311**
Guarantee	**-0.211**	**-0.344**

- Substitution rates are higher in countries with
  - weaker rule of law
  - smaller credit markets
  - more generous mandatory pension systems
  - more underfunded pension systems
  - no pension guarantee fund

Net Effect on Leverage By Country

	Consolidated Leverage	
	Coef	*p*-value
United Kingdom	0.208	[0.00]
Switzerland	0.137	[0.00]
Netherlands	0.125	[0.00]
Sweden	0.105	[0.00]
South Africa	0.081	[0.00]
United States	**0.067**	**[0.00]**
Denmark	0.064	[0.00]
Australia	0.042	[0.00]
Japan	0.034	[0.00]
Canada	0.032	[0.00]
Finland	0.018	[0.50]
Indonesia	-0.006	[0.79]
Malaysia	-0.015	[0.31]
Hong Kong	-0.016	[0.19]
Germany	-0.016	[0.17]
Austria	-0.020	[0.65]
France	-0.020	[0.10]
India	-0.036	[0.00]
Taiwan, Province Of China	-0.039	[0.10]
Norway	-0.076	[0.02]

The net effect on effective leverage is a function of the

- **prevalence**
- **size**

of DB plans, as well as the

- **rate of substitution**

between PBO and regular debt.

In the UK, plan sponsors have 40-60% more leverage compared to non-sponsors.

Financial Flexibility

- PBO can be used as a proxy for financial flexibility
  - Level and timing of DB plan contributions is more flexible than with payments to service regular debt
    - Maximize the associated tax shield benefits by making larger contributions when marginal tax rates are high
    - Financial slack (Ballester, Fried and Livnat, 2002)
    - Earnings management (Bergstresser, Desai and Rauh, 2006)
  - Change post-retirement plan assumptions, even to avoid violations on other liabilities
    - Discount rates
    - Expected long-term rate of return on plan assets
    - Employee turnover
    - Salary scale
    - Mortality
    - …
    - Some choice with regards to valuing the plan assets

Real Investment

- Flexibility of firm's assets and liabilities are hypothesized to be related
  - Firms with more flexibility of their assets may want to have more flexibility of their financing
  - Trade off benefits (flexibility) and costs (investment risk, post-retirement plans are harder to unwind, financial constraints)
- Empirical proxies for type of growth option
  - Research & Development (R&D) (+)
    - Generates real options (e.g. develop new product)
  - Capital Expenditures (CapEx) (-)
    - Executes and thus reduces real options (e.g. set up production facility to commercially exploit research result)
- Effect of mandatory contributions on cost of capital and investment
  - Campbell, Dhaliwal and Schwartz (RFS 2011); Bakke and Whited (JF 2010); Rauh (JF 2006)

Multivariate Analysis

	R&D Expense/ Total Assets		Capital Expenditures/ Total Assets	
	Coef	*p*-value	Coef	*p*-value
PBO/Total Assets	**0.015**	**[0.00]**	**-0.016**	**[0.00]**
Regular Leverage	-0.010	[0.00]	-0.005	[0.00]
Market-to-Book	0.000	[0.00]	0.001	[0.00]
Age (log)	0.002	[0.00]	-0.009	[0.00]
…				
Adjusted R^2	0.35		0.38	
Observations	32,854		32,854	

- The typical plan sponsor has significantly less capital expenditures (by 4.9%) and more research and development (by 12.2%) compared to an otherwise similar non-sponsoring firm
- Results are very robust across countries

Determinants of Plan Investment Risk

- Plan characteristics
  - Funding level/contributions
    - Firms take more risks with pension investments when the plan is fully funded…
    - …or invest more in risky asset when the plan is underfunded to achieve higher returns to reduce the deficit
  - Investment horizon
  - Long-term expected return on plan assets

Determinants of PlanInvestment Risk

- Asset risk/financial risk
  - Risk shifting/asset substitution
    - Firms with high asset risk or financial risk will invest their pension assets more aggressively (underfunding, high risk)
  - Risk management
    - Firms with high asset risk or financial risk will invest their pension assets more conservatively
      - Underfunding can entail high mandatory contributions
      - Equity valuations are low in bad times, when firm can least afford high contributions
      - Negative effect on firm investment
  - Incentives for both risk shifting and risk management are higher when firms are closer to financial distress

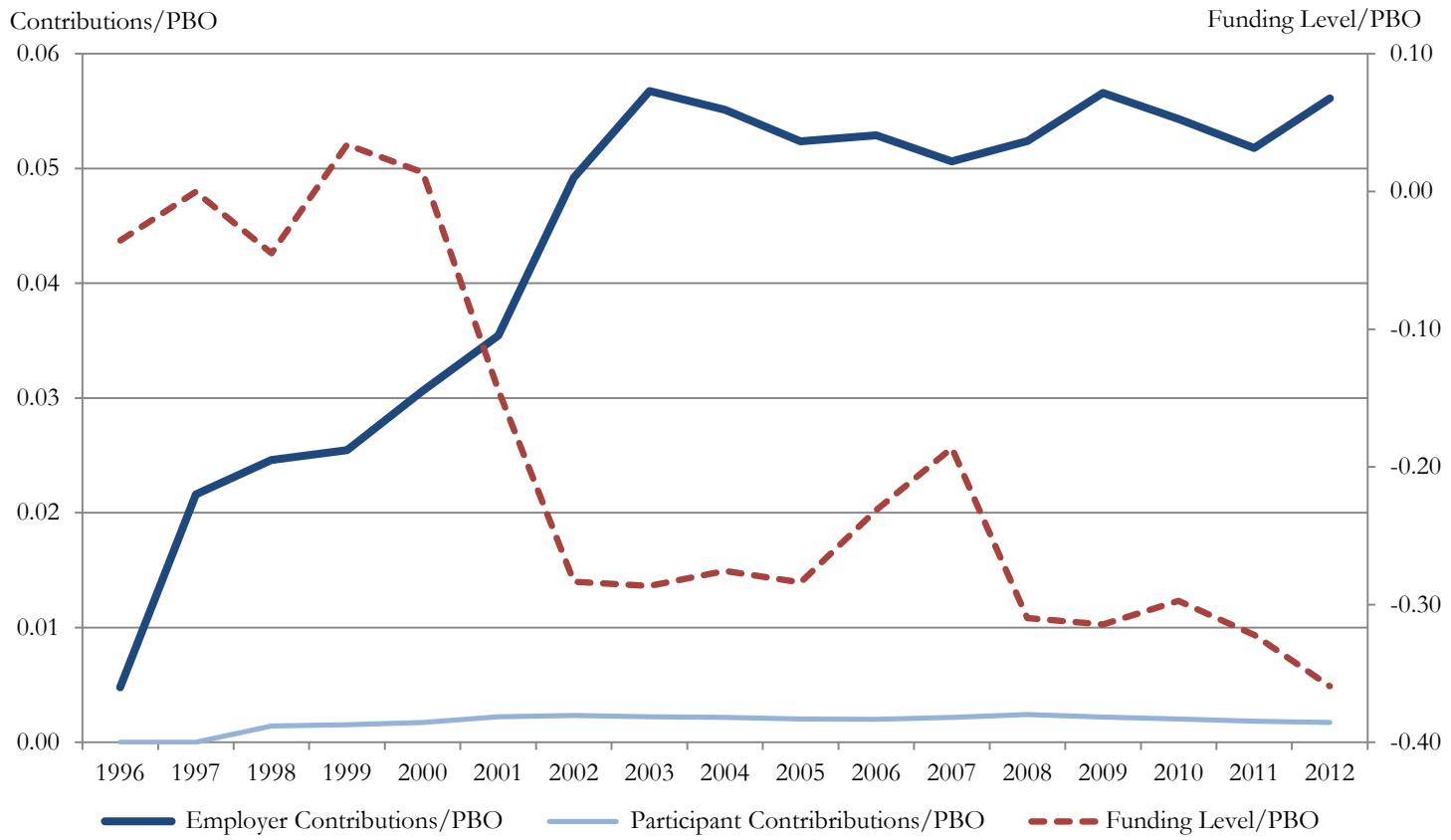
Determinants of Plan Investment Risk

- Taxes
  - Companies are taxed on returns to securities they hold
  - Securities held by pension funds are tax-exempt
  - Contributions to pension funds are tax deductible
  - Tax arbitrage
    - Increase firm leverage and invest pension assets in fixed income securities
  - Firms should fully fund their pension plans and invest entirely in bonds
- Real wages
  - Equity investing of pension assets may hedge against increases in pension benefits that are tied to real wages, which are positively related to stock returns

Investment Risk

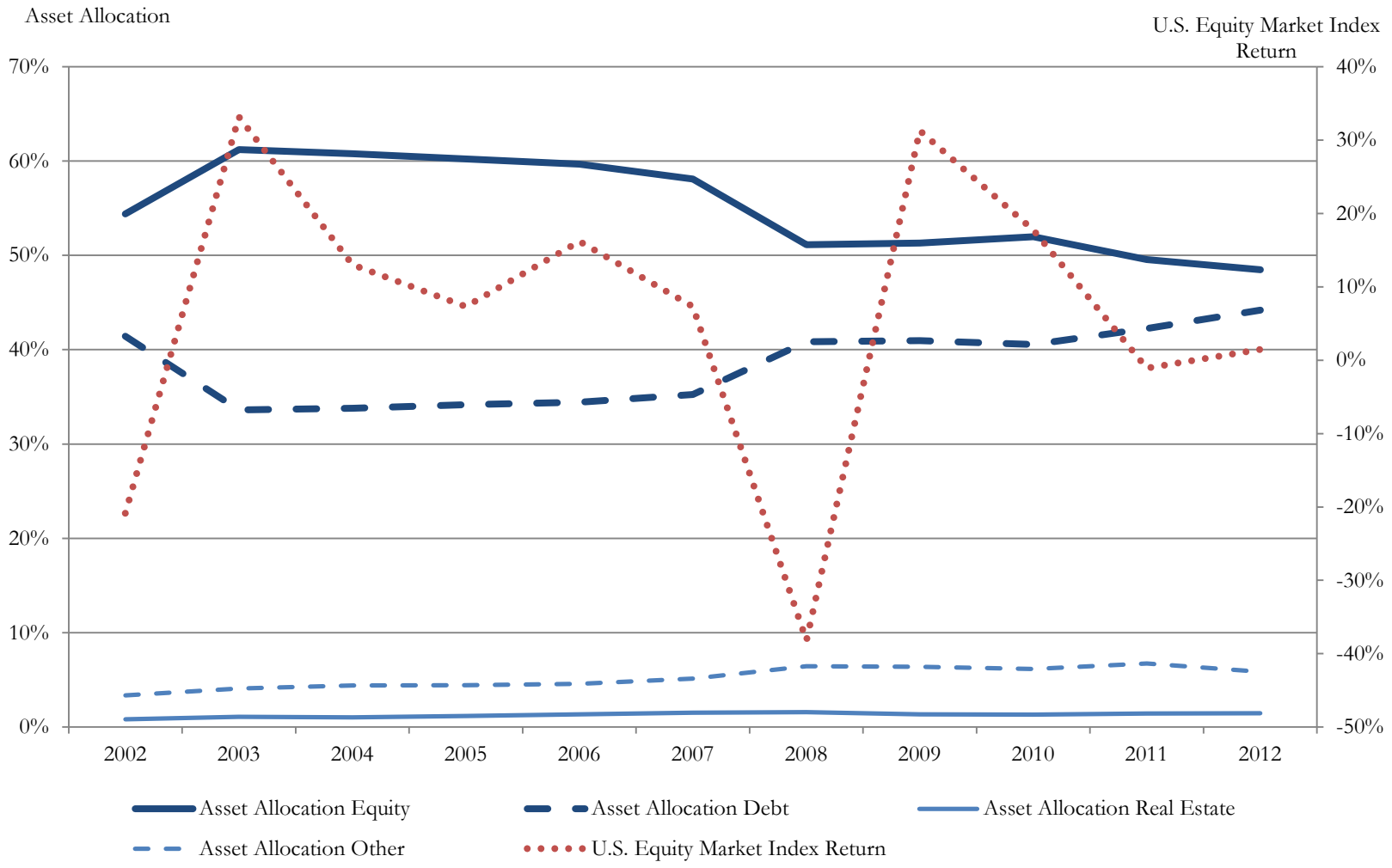
- Firms invest more in equities if they have
  - less cash
  - lower profit volatility
  - less currency exposure
  - higher age
  - longer debt maturity
  - smaller pension plans
  - higher return expectations and volatility
  - smaller employer contributions
  - larger employee contributions
  - weaker past performance
  - longer investment horizon
- Mostly consistent with risk management!

Funding Level and Contributions

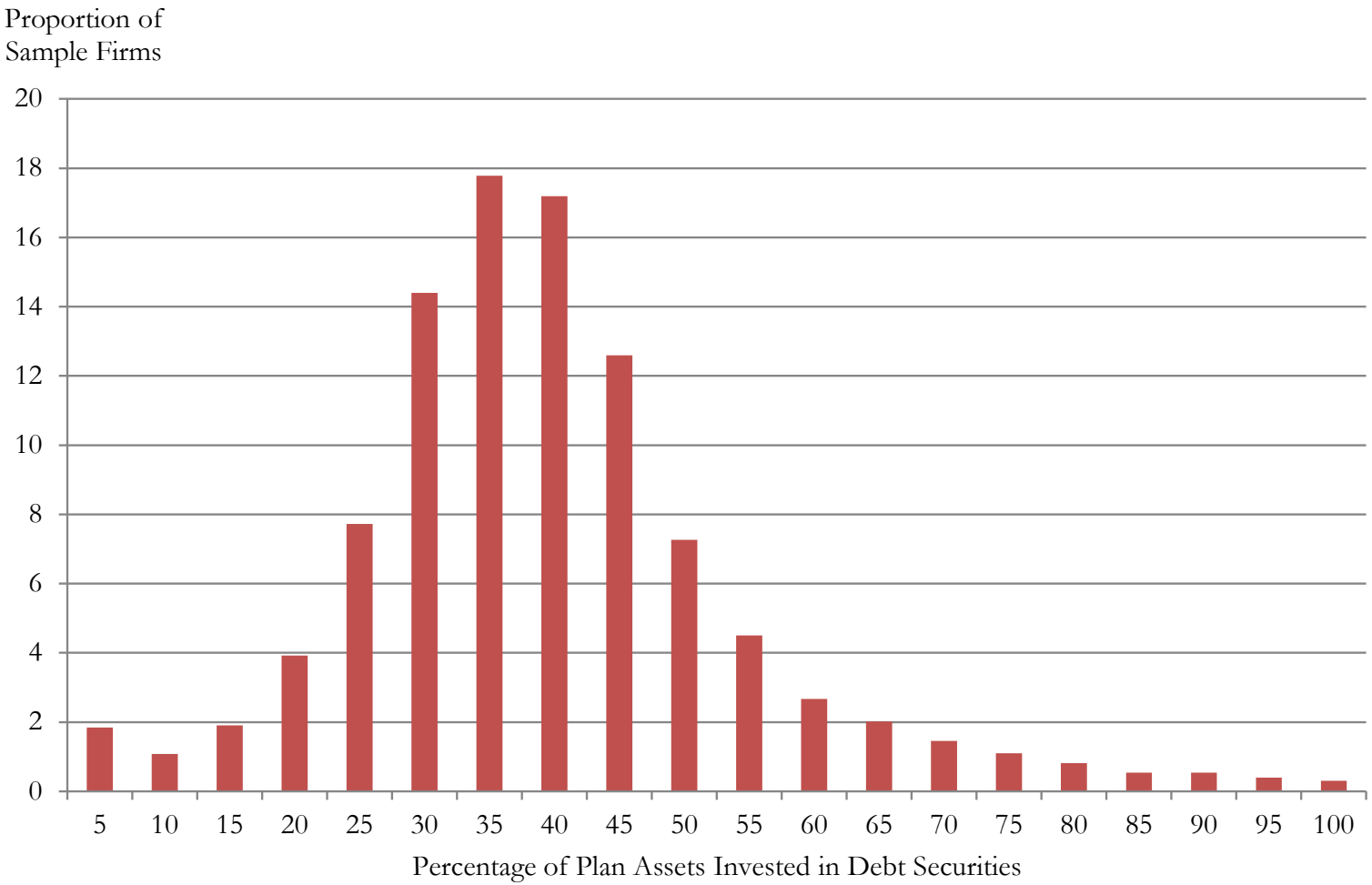


Mostly consistent with (passive) risk shifting?!?

Asset Allocation



Fixed Income Allocation



No support for taxes or risk shifting…

Results Investment Risk

- No support for tax hypothesis here
- Results are similar for
  - Asset allocation to bonds (opposite to allocation to equities)
  - Pension asset beta (systematic risk)
- Results for pension return volatility are more different
  - Total risk
  - Low correlations with other risk measures
  - Firm characteristics are less important
  - Still, apart from funding level, bottom line is effectively also risk management
- Explanatory power between 15%-40%

Many Robustness Tests

- Alternative Estimation Techniques and Calculation of Standard Errors
  - Fixed effects
  - Clustering of Standard Errors (Petersen, 2009)
  - Newey-West (1987) Standard Errors
  - Treatment effects model
  - Simultaneous equations model (3SLS)
- Results by industry
- Results by Size Quintiles
- Firms with consolidated accounts
- Smaller set of control variables
- Unidentified Time-invariant or Transitory Components of Leverage
- Analysis of U.S. firm using CRSP and Compustat

Summary and Conclusion

- Corporate post-retirement plans are economically important
- Net effect is 24% higher leverage of plan sponsors
  - Consolidating DB plans increases leverage by 32%
  - Substitution effect reduces leverage by 23 cents per Dollar of PBO
- Cross country variation
  - Consolidation has large effect on leverage where plans are popular and large
  - Substitution rates vary across countries as a function of employment protection and laws, rule of law and private credit
- Effect of financial flexibility on real investment is conditional on the type of investment opportunities
  - Positive effect on R&D, which generates growth options
  - Negative effect on capital expenditures, which exercises growth options
  - Compared to an otherwise similar firm without post-retirement plan, the average plan sponsor has 4.9% less capital expenditures and 12.2% more research and development

- <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1736803>