

Post-Retirement Benefit Plans, Leverage, and Real Investment

Söhnke M. Bartram

Warwick Business School

Motivation

- ◎ Post-retirement plans are economically important
 - Pensions, Medical plans, Insurance coverage
 - Other welfare benefits
 - Tuition assistance
 - Day care
 - Legal services
 - Housing subsidies provided after retirement
 - Pension fund assets are 67% 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)

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
 - Instrument to investigate the effect of financial flexibility on real investment
 - 33,000 publically traded non-financial firms from 50 countries during the period 2002-2009

Contribution

- ◎ The values of post-retirement assets and liabilities of nonfinancial corporations are economically sizable in many countries
 - Often more than in the U.S.
 - Not fully reflected on the balance sheet despite plans being generally underfunded
- ◎ Consolidating off-balance sheet post-retirement plans increases effective leverage on average by 32%
 - However, they do not matter for gearing of firms in about half the sample countries
 - Significant cross-country variation with regards to the extent to which projected benefit obligations substitute for regular debt (0%-100%)
- ◎ Effect of financial flexibility on real investment is conditional on the type of investment opportunity/growth option
 - 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

Agenda

- ⊙ Hypotheses
- ⊙ Sample and Data
- ⊙ Results
 - Leverage
 - Real Investment
- ⊙ Robustness Tests
- ⊙ Summary and Conclusion

Post-Retirement Benefits

- ⦿ Periodic contributions go through income statement
- ⦿ Assets and liabilities are treated as off-balance sheet items
 - Balance sheet only shows net amount
 - Additional minimum liability for severely underfunded plans, off-set by intangible asset and possibly charge to book equity
- ⦿ 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)

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)
 - 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)
 - Consolidated Leverage is likely higher than Regular Leverage since $TD/TA < (TD + PO)/(TA + PA)$
 - 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
 - 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

Financial Flexibility

- ◎ PBO can be used as an instrument 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
 - Earnings management (Bergstresser, Desai and Rauh, 2006)
 - Change post-retirement plan assumptions to avoid violations on other liabilities
 - Employee turnover, early retirement, salary scale (typically a function of productivity improvements, inflation, merit or promotional increases, seniority raises), disability, family composition, mortality, retirement age, per capita claims cost by age group, healthcare cost trend rate, medical coverage to be paid by governmental authorities and other providers of health care benefits, discount rates, expected long-term rate of return on plan assets, etc.
 - Some choice with regards to how and when to determine the fair value of the plan assets
 - Health care obligations may not be legally binding

Real Investment

- ◎ Flexibility of firm's assets and liabilities are hypothesized to be related (flexibility matching)
 - Similar to matching the currency, duration, etc.
 - 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)
- ◎ Conditional relation between financial flexibility and type of growth option/real investment
- ◎ Empirical proxies for type of growth option
 - Research & Development (R&D) (+)
 - E.g. develop new product
 - Generates real options
 - Capital Expenditures (CapEx) (-)
 - Set up production facility to commercially exploit research result
 - Executes and thus reduces real options

Real Investment

- ◎ Optimal debt level is conditional on the type of growth option (Childs et al., JFE 2005)
 - Effect of financial flexibility on the firm's initial debt level depends on the characteristics of the firm's growth option
 - Exercising the option replaces assets-in-place with a riskier asset underlying the growth option
 - Firm with dynamic debt will choose a larger initial level of debt than a firm with static debt
 - Can later reduce leverage when the growth option is exercised
 - Exercising the growth option expands assets-in-place
 - Firm with dynamic debt is less aggressive with its initial leverage choice
 - Can increase the debt level when the growth option is exercised
- ◎ Conditional relation between debt level and type of growth option
- ◎ Large technology and pharmaceutical firms
 - Johnson & Johnson, Merck, Nec, Novartis, Pfizer, Pioneer, Sanofi-Aventis, Roche, Texas Instruments, Toshiba

Sample and Data

◎ Sample

- 33,260 companies from 50 countries
- Various screens
 - No financial firms, utilities, or ADRs
 - Only primary listing
 - Exclude U.S. OTC Bulletin Board and 'Pink Sheet' stocks
 - Drop countries with small number of observations
- 2002-2009

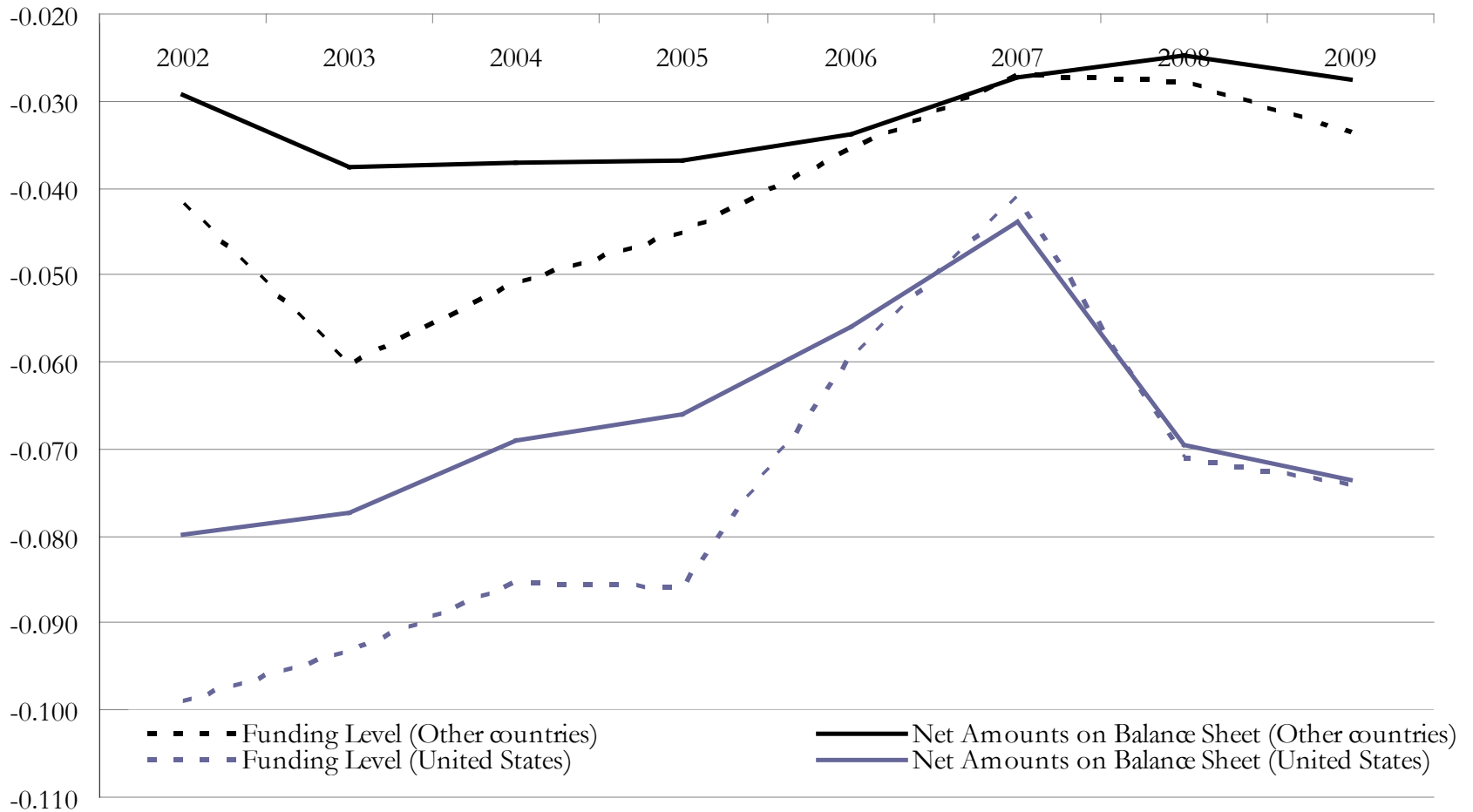
◎ WorldScope

- Post-retirement data
 - PBO, Fair value of assets, periodic cost, accrued/prepaid cost
 - Infer contributions, intangible assets
 - Classify firms as having DB plan if balance sheet shows PBO
 - Pension, health care, either
- Datastream
 - Weekly stock returns in USD
 - Total risk, market risk, idiosyncratic risk (Bekaert, et al. JF 2010)

Post-Retirement Obligations

- ◎ DB plans are popular in many countries
 - Switzerland (61.9%), Austria (57.6%), Ireland (54.4%), Mexico (48.1%), Philippines (45.0%), Netherlands (42.7%), Taiwan (38.5%), Pakistan (38.2%), Luxembourg (38.0%), Japan (37.6%), and Norway (36.5%)
 - Mostly pensions, health care only relevant in U.S. (13.7%)
 - Largest plans in Venezuela, the United Kingdom, the Netherlands, Switzerland, and Ireland
 - PBO is 27% of total assets in UK
 - Plans underfunded in 48 out of 50 countries by 2.6% of total assets
 - Venezuela (23.9%), the United Kingdom (7.9%), Netherlands (7.6%), Switzerland (7.2%), Ireland (5.3%)
 - Net amounts on balance sheet typically smaller than true level of underfunding

Plan Underfunding



Leverage

- ◎ Total liabilities, total debt, long-term debt plus preferred stock, long-term debt
 - Scaled by market or book values of total assets
 - including or excluding payables and other liabilities
 - with or without netting cash and short-term investments
 - Rajan and Zingales (JF 1995)
- ◎ Regular leverage vs. consolidated leverage
 - Redefine assets as total assets minus prepaid cost (including intangible pension asset) plus fair value of plan assets
 - Increase debt by the present value of the post-retirement plan liabilities minus already recognized post-retirement items (accrued cost, additional minimum liability)
 - Aggregate (consolidated) interest expense is the sum of regular interest expense and post-retirement contributions
 - Netting does not reflect actual size of plan

Regular and Consolidated Leverage

	N	Consolidated	Regular	Difference	Test	
		Mean	Mean	Means	t-Test	Wilcoxon
Gross Leverage						
TotalDebt / TotalAssets	38,387	0.317	0.257	0.060	<0.001	<0.001
LongTermDebtAndPreferredStock / TotalAssets	35,481	0.245	0.180	0.065	<0.001	<0.001
LongTermDebt / TotalAssets	35,311	0.241	0.176	0.065	<0.001	<0.001
TotalDebt / SizeMarketValue	37,024	0.367	0.302	0.065	<0.001	<0.001
LongTermDebtAndPreferredStock / SizeMarketValue	34,266	0.270	0.197	0.073	<0.001	<0.001
LongTermDebt / SizeMarketValue	34,101	0.267	0.193	0.073	<0.001	<0.001
Leverage Net of Cash and Short-term Investments						
TotalDebt / TotalAssets	38,387	0.210	0.126	0.084	<0.001	<0.001
LongTermDebtAndPreferredStock / TotalAssets	35,481	0.137	0.050	0.087	<0.001	<0.001
LongTermDebt / TotalAssets	35,311	0.133	0.046	0.088	<0.001	<0.001
TotalDebt / SizeMarketValue	36,830	0.251	0.145	0.106	<0.001	<0.001
LongTermDebtAndPreferredStock / SizeMarketValue	34,123	0.146	0.029	0.116	<0.001	<0.001
LongTermDebt / SizeMarketValue	33,958	0.142	0.025	0.116	<0.001	<0.001

- ⊙ Consolidated leverage is 32% higher than regular leverage
 - Economically and statistically significant differences
- ⊙ Results are robust to preferred measure of leverage

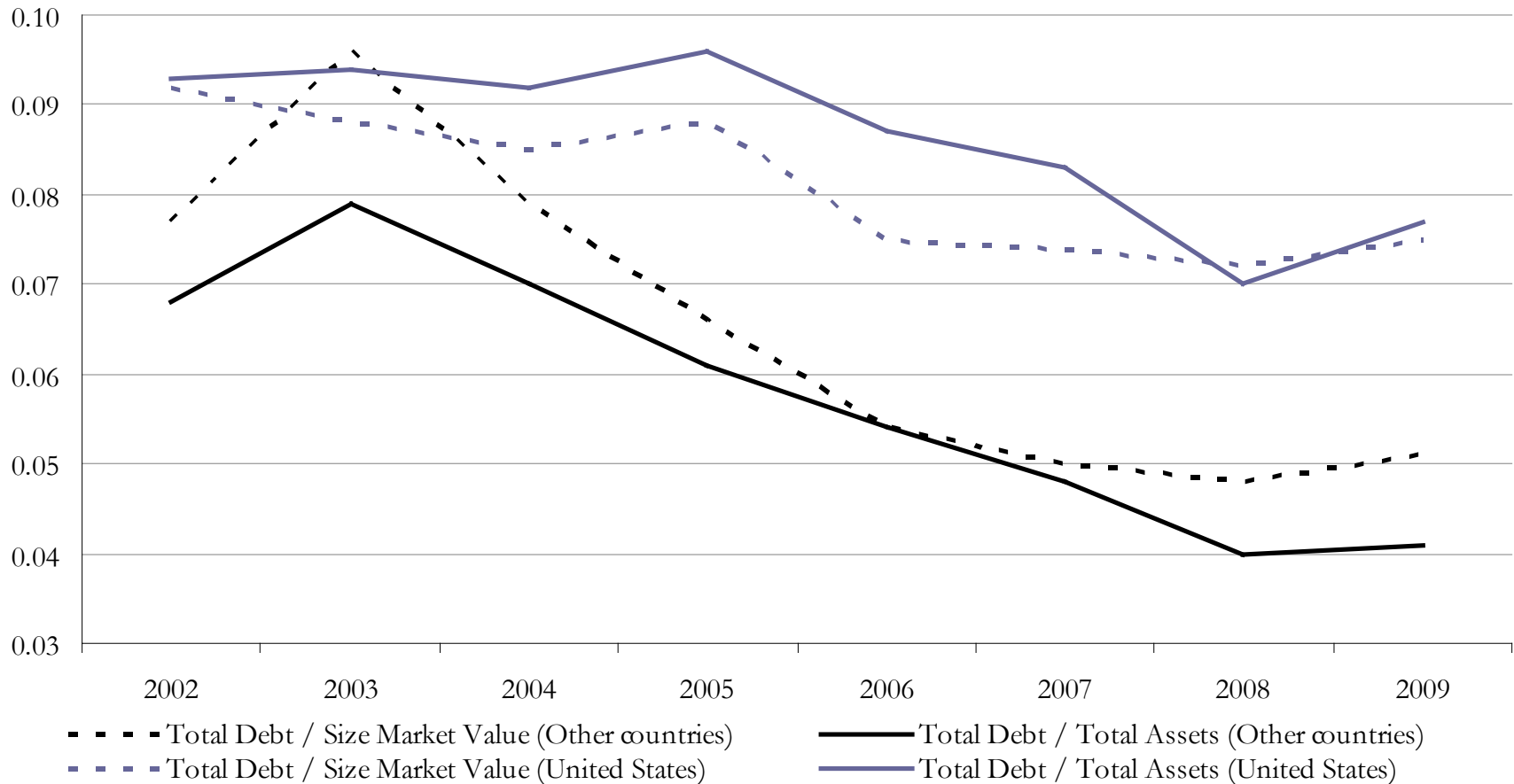
Consolidated Leverage - Regular Leverage

Country	N	Consolidated Leverage - Regular Leverage					
		Total Debt / Size Market Value	Long-Term Debt and Preferred Stock / Market Value	Long-Term Debt / Size Market Value	Total Debt / Total Assets	Long-Term Debt and Preferred Stock / Total Assets	Long-Term Debt / Total Assets
Argentina	18	0.004	0.004	0.004	0.003	0.003	0.003
Australia	382	0.027 **	0.027 **	0.028 ***	0.032 ***	0.030 ***	0.030 ***
Austria	244	0.034 *	0.037 **	0.037 **	0.030 **	0.031 ***	0.031 ***
Belgium	231	0.047 **	0.049 ***	0.049 ***	0.043 ***	0.043 ***	0.042 ***
Brazil	225	0.048 **	0.060 ***	0.060 ***	0.053 ***	0.059 ***	0.059 ***
Canada	1,137	0.066 ***	0.072 ***	0.073 ***	0.068 ***	0.071 ***	0.071 ***
Denmark	158	0.019	0.021	0.021	0.021	0.024	0.024
Finland	255	0.044 **	0.052 ***	0.052 ***	0.048 ***	0.054 ***	0.054 ***
France	1,161	0.026 ***	0.031 ***	0.031 ***	0.023 ***	0.025 ***	0.025 ***
Germany	1,523	0.028 ***	0.032 ***	0.032 ***	0.025 ***	0.028 ***	0.028 ***
Greece	396	0.006	0.009	0.009	0.005	0.007	0.007
Hong Kong	295	0.031 *	0.039 ***	0.039 ***	0.028 **	0.032 ***	0.032 ***
India	1,822	0.011	0.014 **	0.013 **	0.009	0.009 **	0.011 **
Indonesia	536	0.008	0.009	0.009	0.002	0.005	0.006
Ireland	189	0.104 ***	0.105 ***	0.105 ***	0.102 ***	0.096 ***	0.098 ***
Israel	65	0.013	0.015	0.017	0.010	0.007	0.010
Italy	160	0.019	0.023	0.023	0.018	0.020	0.020
Japan	9,962	0.069 ***	0.080 ***	0.080 ***	0.052 ***	0.057 ***	0.057 ***
Luxembourg	24	0.000	0.001	0.001	0.004	0.005	0.005
Malaysia	512	0.005	0.007	0.007	0.004	0.005	0.005
Mexico	340	0.019	0.022	0.023	0.017	0.019	0.019
Netherlands	379	0.129 ***	0.132 ***	0.134 ***	0.132 ***	0.136 ***	0.137 ***
New Zealand	22	0.032	0.035	0.035	0.044	0.047	0.047
Norway	525	0.034 **	0.038 ***	0.039 ***	0.034 ***	0.037 ***	0.037 ***
Pakistan	251	0.017	0.015 *	0.015	0.024	0.023 **	0.021 **
Philippines	380	0.019	0.025 *	0.027 **	0.013	0.017 **	0.017 **
Portugal	66	0.019	0.022	0.022	0.020	0.023	0.023
Russian Federation	149	0.008	0.008	0.008	0.007	0.007	0.007
Singapore	69	0.002	0.016	0.016	0.006	0.011	0.011
South Africa	350	0.057 ***	0.074 ***	0.072 ***	0.061 ***	0.074 ***	0.075 ***
Spain	53	0.003	0.005	0.007	0.005	0.006	0.006
Sweden	466	0.053 ***	0.058 ***	0.057 ***	0.055 ***	0.057 ***	0.057 ***
Switzerland	791	0.142 ***	0.158 ***	0.158 ***	0.148 ***	0.159 ***	0.159 ***
Taiwan, Province Of China	3,952	0.011 **	0.013 ***	0.013 ***	0.010 ***	0.011 ***	0.011 ***
Turkey	40	0.006	0.006	0.006	0.005	0.005	0.005
United Kingdom	2,984	0.204 ***	0.214 ***	0.218 ***	0.195 ***	0.199 ***	0.202 ***
United States	7,586	0.081 ***	0.089 ***	0.089 ***	0.087 ***	0.089 ***	0.091 ***

Regular and Consolidated Leverage

- ◎ Off-balance sheet post-retirement plans tend to increase effective (i.e. consolidated) leverage
 - Significant variation across countries
 - No statistically significant difference in about half of 36 countries
 - Difference is always positive
 - Difference often large in countries where defined benefit plans are most important
 - United Kingdom, Switzerland, the Netherlands, Ireland, the United States and Canada
 - United States
 - Consolidated leverage is about twice regular leverage (multiple of 1.7-2.2)
 - Shivdasani and Stefanescu (RFS 2010) find factor of 1.4
 - United Kingdom
 - Consolidated leverage is three to four times regular leverage

Regular and Consolidated Leverage



Firms With and Without Plans

	With		Without		Difference Means	Test	
	N	Mean	N	Mean		t-Test	Wilcoxon
Gross Leverage							
Total Debt/Size Market Value	39,230	0.28	147,410	0.24	0.04	<0.001	<0.001
Total Debt/Size Market Value (consolidated)	36,514	0.37					
Total Debt/Total Assets	40,603	0.24	163,093	0.22	0.02	<0.001	<0.001
Total Debt/Total Assets (consolidated)	37,780	0.32					
Leverage Net of Cash and Short-term Investments							
Total Debt/Size Market Value	38,946	0.10	144,614	-0.01	0.11	<0.001	<0.001
Total Debt/Size Market Value (consolidated)	36,412	0.25					
Total Debt/Total Assets	40,602	0.08	162,791	-0.25	0.33	<0.001	<0.001
Total Debt/Total Assets (consolidated)	37,780	0.21					
Tax Rate	31,535	0.34	98,099	0.29	0.05	<0.001	<0.001
ROA	40,118	0.05	153,571	-0.04	0.09	<0.001	<0.001
Volatility of ROA (log)	39,471	-3.61	161,163	-3.04	-0.57	<0.001	<0.001
Annualized Idiosyncratic Risk (log)	37,901	-1.26	159,625	-0.76	-0.49	<0.001	<0.001
Annualized Market Risk (log)	37,901	-1.47	159,625	-1.28	-0.19	<0.001	<0.001
Annualized Total Risk (log)	37,901	-0.97	159,625	-0.58	-0.39	<0.001	<0.001
Total Assets USD (log)	40,602	13.4	163,291	11.1	2.31	<0.001	<0.001
Market-to-Book	39,236	2.05	147,609	2.34	-0.29	<0.001	<0.001
R&D/Total Assets	40,617	0.02	285,093	0.01	0.00	<0.001	<0.001
Capital Expenditures/Total Assets	40,617	0.05	285,093	0.03	0.02	<0.001	<0.001
Net PPE/Total Assets	40,596	0.32	162,374	0.30	0.02	<0.001	<0.001
Negative Book Equity (dummy)	40,617	0.03	285,093	0.04	-0.01	<0.001	<0.001
Dividend (dummy)	40,617	0.77	285,093	0.26	0.50	<0.001	<0.001
Z-Score	37,397	2.49	138,197	1.04	1.45	<0.001	<0.001

Firms With and Without Plans

- ◎ Substitution effect?
 - Firms with plans actually have *higher* regular leverage
 - Also *higher* average tax rates
- ◎ However, firms with and without post-retirement plans are very different along many dimensions
 - Plan sponsors have more debt capacity, e.g. larger size, higher Z-Score and profitability (Graham, 2000)
 - Similar findings for U.S. firms in Shivdasani and Stefanescu (RFS 2010)
 - Multivariate analysis required

Tax Benefits

Post-Retirement Benefits						
Year	N	Interest Expense Ratio	Tax Benefits (5%)/Total Assets	Tax Benefits (Avg)/Total Assets	Tax Benefits (5%)/Market Cap	Tax Benefits (Avg)/Market Cap
2002	1,930	1.12	0.11	0.13	0.28	0.36
2003	3,831	1.44	0.14	0.24	0.38	0.75
2004	4,497	1.49	0.13	0.23	0.27	0.56
2005	5,096	1.31	0.10	0.19	0.20	0.42
2006	5,156	1.30	0.11	0.18	0.18	0.33
2007	5,256	1.38	0.13	0.18	0.22	0.35
2008	5,828	1.11	0.10	0.14	0.30	0.45
2009	5,840	1.17	0.11	0.16	0.36	0.55
Mean	37,434	4.77	0.11	0.18	0.27	0.46
Median	37,434	1.27	0.08	0.10	0.10	0.13
StdDev	37,434	15.3	0.17	0.31	0.53	1.01
United States	7,522	1.13	0.14	0.12	0.23	0.19
Other Countries	29,912	1.33	0.11	0.20	0.28	0.53

Tax Benefits

	N	Interest Expense Ratio	Tax			
			Benefits (5%)/Total Assets	Tax Benefits (Avg)/Total Assets	Tax Benefits (5%)/Market Cap	Tax Benefits (Avg)/Market Cap
Post-Retirement Benefits						
All	37,434	1.27	0.11	0.18	0.27	0.46
United States	7,522	1.13	0.14	0.12	0.23	0.19
Other Countries	29,912	1.33	0.11	0.20	0.28	0.53
Pension Benefits						
All	36,954	1.25	0.13	0.10	0.22	0.17
United States	7,183	1.10	0.13	0.11	0.23	0.17
Other Countries	29,771	1.32	0.11	0.08	0.20	0.15
HealthCare Benefits						
All	7,298	1.06	0.11	0.18	0.26	0.47
United States	5,122	1.07	0.13	0.11	0.22	0.19
Other Countries	2,176	1.04	0.11	0.20	0.28	0.53

- ⊙ Contributions are economically significant compared to other sources of financial leverage
- ⊙ Of a total tax shield of 18% of total assets, 3.8% come from post-retirement benefits, and 14.2% from interest expense on debt
- ⊙ Tax benefits are larger outside the United States
- ⊙ Health care plans also provide tax shields but only to few firms

Quintiles by PBO

	PBO/Total Assets					High-Low	p-value
	Low	2	3	4	High		
Post-Retirement Plan							
PBO/Total Assets	0.01	0.02	0.06	0.13	0.32	0.32	[0.00]
Fair Value of Plan Assets/Total Assets	0.00	0.01	0.04	0.09	0.34	0.34	[0.00]
Funding Level/Total Assets	0.00	-0.01	-0.03	-0.05	-0.12	-0.11	[0.00]
Tax Benefits							
Interest Expense Ratio	1.04	1.14	1.46	2.02	2.01	0.97	[0.00]
Tax Benefits (5%)/Total Assets	0.08	0.08	0.11	0.13	0.16	0.08	[0.00]
Tax Benefits (Avg)/Total Assets	0.10	0.11	0.19	0.25	0.24	0.14	[0.00]
Tax Benefits (5%)/Market Cap	0.21	0.21	0.28	0.31	0.34	0.13	[0.04]
Tax Benefits (Avg)/Market Cap	0.28	0.29	0.56	0.63	0.56	0.28	[0.00]
Regular Leverage							
Total Debt / Total Assets	0.26	0.24	0.24	0.24	0.23	-0.04	[0.01]
Total Debt / Size Market Value	0.29	0.28	0.29	0.29	0.27	-0.02	[0.43]
Consolidated Leverage							
Total Debt / Total Assets	0.29	0.27	0.29	0.32	0.45	0.16	[0.00]
Total Debt/Size Market Value	0.32	0.31	0.35	0.38	0.50	0.18	[0.00]
Real Investment							
Capital Expenditures / Total Assets	0.064	0.051	0.046	0.044	0.044	-0.020	[0.00]
R&D / Total Assets	0.013	0.015	0.013	0.018	0.022	0.009	[0.00]

Quintiles by Consolidated Leverage

	Total Debt / Total Assets					High-Low	p-value
	Low	2	3	4	High		
Consolidated Leverage							
Total Debt / Total Assets	0.08	0.21	0.31	0.41	0.61	0.53	[0.00]
Total Debt/Size Market Value	0.11	0.26	0.37	0.49	0.64	0.53	[0.00]
Regular Leverage							
Total Debt / Total Assets	0.05	0.16	0.25	0.34	0.49	0.44	[0.00]
Total Debt/Size Market Value	0.08	0.21	0.31	0.41	0.52	0.44	[0.00]
Pension Plan							
PBO/Total Assets	0.05	0.08	0.10	0.13	0.20	0.15	[0.00]
Fair Value of Plan Assets/Total Assets	0.03	0.05	0.07	0.11	0.22	0.19	[0.00]
Funding Level/Total Assets	-0.03	-0.03	-0.04	-0.05	-0.07	-0.05	[0.00]
Tax Benefits							
Interest Expense Ratio	1.94	1.40	1.23	1.23	1.16	-0.78	[0.00]
Tax Benefits (5%)/Total Assets	0.06	0.09	0.12	0.15	0.21	0.15	[0.00]
Tax Benefits (Avg)/Total Assets	0.11	0.17	0.18	0.20	0.25	0.14	[0.00]
Tax Benefits (5%)/Market Cap	0.11	0.19	0.27	0.38	0.59	0.48	[0.00]
Tax Benefits (Avg)/Market Cap	0.24	0.37	0.45	0.58	0.83	0.59	[0.00]
Real Investment							
Capital Expenditures / Total Assets	0.044	0.052	0.053	0.052	0.053	0.009	[0.08]
R&D / Total Assets	0.022	0.017	0.013	0.013	0.012	-0.010	[0.00]

Quintiles by Regular Leverage

	Total Debt / Total Assets					High-Low	p-value
	Low	2	3	4	High		
Regular Leverage							
Total Debt / Total Assets	0.01	0.12	0.22	0.33	0.53	0.51	[0.00]
Total Debt/Size Market Value	0.02	0.16	0.28	0.40	0.57	0.54	[0.00]
Consolidated Leverage							
Total Debt / Total Assets	0.10	0.20	0.30	0.38	0.56	0.46	[0.00]
Total Debt/Size Market Value	0.13	0.25	0.35	0.45	0.60	0.47	[0.00]
Pension Plan							
PBO/Total Assets	0.11	0.12	0.12	0.10	0.09	-0.02	[0.16]
Fair Value of Plan Assets/Total Assets	0.10	0.11	0.11	0.09	0.07	-0.03	[0.02]
Funding Level/Total Assets	-0.04	-0.05	-0.05	-0.04	-0.04	0.00	[0.79]
Tax Benefits							
Interest Expense Ratio	4.35	1.73	1.34	1.19	1.09	-3.27	[0.00]
Tax Benefits (5%)/Total Assets	0.06	0.09	0.12	0.14	0.20	0.13	[0.00]
Tax Benefits (Avg)/Total Assets	0.13	0.16	0.17	0.19	0.24	0.11	[0.00]
Tax Benefits (5%)/Market Cap	0.10	0.17	0.25	0.35	0.59	0.48	[0.00]
Tax Benefits (Avg)/Market Cap	0.25	0.35	0.41	0.54	0.85	0.59	[0.00]
Real Investment							
Capital Expenditures / Total Assets	0.039	0.048	0.051	0.054	0.056	0.017	[0.00]
R&D / Total Assets	0.026	0.019	0.015	0.011	0.009	-0.017	[0.00]

Multivariate Analysis with CapEx

Variable	Capital Expenditures/ Total Assets				Leverage		PBO/Total Assets		Post-Retirement Benefit Plan	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value		
	PBO/Total Assets *	-0.016	[0.00]	-0.223	[0.00]					
Post-Retirement Benefit Plan *							0.110	[0.00]		
Leverage *	-0.005	[0.00]					-0.050	[0.00]		
Capital Expenditures/Total Assets *			0.180	[0.00]						
Employees (log)							0.006	[0.00]	0.374	[0.00]
Market-to-Book	0.001	[0.00]	0.006	[0.00]			0.001	[0.00]	0.004	[0.08]
ROA (3-year average)							-0.059	[0.00]	-0.629	[0.00]
Volatility of ROA (log)					-0.011	[0.00]	0.005	[0.00]	-0.087	[0.00]
Age (log)	-0.009	[0.00]					0.017	[0.00]		
Total Risk (log)	0.004	[0.00]	0.055	[0.00]			-0.003	[0.01]		
Tax Rate			0.019	[0.00]						
Total Assets in USD (log)	0.000	[0.62]	0.013	[0.00]						
Dividend	0.001	[0.34]	-0.033	[0.00]						
Tangible Assets/Total Assets	0.011	[0.00]	-0.141	[0.00]						
Net FX-Exposure	-0.005	[0.00]	-0.032	[0.00]						
Debt Maturity	0.003	[0.00]	0.102	[0.00]						
Gross Profit Margin (3-year average)	0.014	[0.00]	-0.063	[0.00]						
Preferred Stock/Size Market Value	-0.042	[0.00]	-0.195	[0.00]						
Negative Book Equity			0.431	[0.00]						
Industry Median Leverage			0.518	[0.00]						
Net PPE/Total Assets	0.150	[0.00]								
Convertible Debt/Size Market Value	-0.004	[0.52]								
(Cash + Short-Term Investments)/Total Assets (log)	0.002	[0.00]								
Intercept	0.025	[0.00]	-0.003	[0.76]			-0.061	[0.00]	-3.661	[0.00]
Adjusted R ²			0.38		0.32		0.47		0.49	
Observations			32,854							

Multivariate Analysis with R&D

Variable	R&D Expense/ Total Assets		Leverage		PBO/Total Assets		Post-Retirement Benefit Plan	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
PBO/Total Assets *	0.015	[0.00]	-0.222	[0.00]				
Post-Retirement Benefit Plan *					0.110	[0.00]		
Leverage *	-0.010	[0.00]			-0.050	[0.00]		
R&D Expense/Total Assets *			-0.368	[0.00]				
Employees (log)					0.006	[0.00]	0.374	[0.00]
Market-to-Book	0.000	[0.00]	0.006	[0.00]	0.001	[0.00]	0.004	[0.08]
ROA (3-year average)					-0.059	[0.00]	-0.629	[0.00]
Volatility of ROA (log)			-0.010	[0.00]	0.005	[0.00]	-0.087	[0.00]
Age (log)	0.002	[0.00]			0.017	[0.00]		
Total Risk (log)	0.004	[0.00]	0.056	[0.00]	-0.003	[0.01]		
Tax Rate			0.015	[0.00]				
Total Assets in USD (log)	0.000	[0.86]	0.013	[0.00]				
Dividend	-0.004	[0.00]	-0.035	[0.00]				
Tangible Assets/Total Assets	0.013	[0.00]	-0.121	[0.00]				
Net FX-Exposure	0.017	[0.00]	-0.028	[0.00]				
Debt Maturity	-0.001	[0.25]	0.105	[0.00]				
Gross Profit Margin (3-year average)	0.048	[0.00]	-0.040	[0.00]				
Preferred Stock/Size Market Value	0.056	[0.00]	-0.193	[0.00]				
Negative Book Equity			0.433	[0.00]				
Industry Median Leverage			0.513	[0.00]				
Net PPE/Total Assets	-0.010	[0.00]						
Convertible Debt/Size Market Value	0.021	[0.00]						
(Cash + Short-Term Investments)/Total Assets (log)	0.002	[0.00]						
Intercept	0.003	[0.19]	-0.009	[0.33]	-0.061	[0.00]	-3.661	[0.00]
Adjusted R ²	0.35		0.33		0.47		0.49	
Observations	32,854							

Multivariate Results

- ◎ The size of post-retirement liabilities is negatively related to regular leverage
 - Coefficient = -0.223
 - Both sources of leverage are far from being perfect substitutes
 - Consolidated leverage: 0.613
- ◎ Post-retirement obligations
 - Capital expenditures: -0.016
 - Research & Development: +0.015
 - 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
- ◎ Regular Leverage
 - Capital expenditures: +0.180
 - Research & Development: -0.368
- ◎ The results are robust to other dimensions of financial policy, such as debt maturity, dividends, preferred stock, convertible debt, and leverage that also affect real investment

CapEx Results By Country

	Capital Expenditures		Leverage Equation				Observations
	Equation		PBO/Total Assets		Capital Expenditures/ Total Assets		
	Coef	<i>p</i> -value	Coef	<i>p</i> -value	Coef	<i>p</i> -value	
Australia	-0.109	[0.01]	-0.270	[0.00]	0.005	[0.94]	863
Austria	0.039	[0.73]	-0.628	[0.04]	0.245	[0.38]	120
Canada	-0.063	[0.06]	-0.264	[0.00]	0.232	[0.00]	754
Denmark	-0.102	[0.33]	0.175	[0.53]	0.519	[0.01]	190
Finland	-0.206	[0.01]	-0.627	[0.00]	-0.045	[0.80]	218
France	-0.003	[0.90]	-0.519	[0.00]	0.491	[0.00]	645
Germany	-0.029	[0.03]	-0.397	[0.00]	0.037	[0.77]	906
Hong Kong	-0.083	[0.19]	-0.728	[0.00]	0.139	[0.04]	1,433
India	0.004	[0.94]	-0.607	[0.00]	0.608	[0.00]	1,220
Indonesia	0.020	[0.79]	-0.664	[0.00]	0.164	[0.22]	514
Japan	-0.001	[0.93]	-0.144	[0.00]	0.087	[0.09]	5,387
Malaysia	0.002	[0.98]	-0.003	[0.99]	0.253	[0.00]	1,089
Netherlands	-0.025	[0.10]	-0.212	[0.00]	0.738	[0.00]	265
Norway	-0.104	[0.39]	-0.708	[0.01]	0.370	[0.13]	153
South Africa	-0.036	[0.10]	-0.077	[0.16]	0.524	[0.00]	377
Sweden	0.000	[0.99]	-0.303	[0.00]	0.292	[0.11]	426
Switzerland	-0.001	[0.87]	-0.170	[0.00]	-0.178	[0.45]	425
Taiwan, Province Of China	-0.136	[0.02]	-1.070	[0.00]	0.371	[0.00]	1,510
United Kingdom	-0.011	[0.02]	-0.191	[0.00]	0.185	[0.00]	2,880
United States	-0.010	[0.01]	-0.226	[0.00]	0.017	[0.62]	9,217
Developed countries	-0.020	[0.00]	-0.160	[0.00]	0.115	[0.00]	25,501
Developing countries	-0.017	[0.36]	-0.290	[0.00]	0.323	[0.00]	7,353

R&D Results By Country

	R&D Expense Equation		Leverage Equation				Observations
	PBO/Total Assets		PBO/Total Assets		R&D Expense/ Total Assets		
	Coef	<i>p</i> -value	Coef	<i>p</i> -value	Coef	<i>p</i> -value	
Australia	0.018	[0.49]	-0.270	[0.00]	-0.169	[0.22]	863
Austria	0.037	[0.36]	-0.643	[0.05]	-0.051	[0.95]	120
Canada	0.022	[0.12]	-0.262	[0.00]	-0.839	[0.00]	754
Denmark	0.212	[0.01]	0.304	[0.29]	-0.461	[0.13]	190
Finland	-0.067	[0.30]	-0.621	[0.00]	-0.416	[0.14]	218
France	-0.009	[0.77]	-0.529	[0.00]	-0.185	[0.11]	645
Germany	0.039	[0.00]	-0.310	[0.00]	-1.277	[0.00]	906
Hong Kong	0.010	[0.48]	-0.740	[0.00]	-0.809	[0.01]	1,433
India	0.004	[0.80]	-0.670	[0.00]	0.407	[0.09]	1,220
Indonesia	0.003	[0.56]	-0.674	[0.00]	0.792	[0.73]	514
Japan	0.038	[0.00]	-0.122	[0.00]	-0.536	[0.00]	5,387
Malaysia	0.052	[0.00]	0.172	[0.56]	-3.808	[0.00]	1,089
Netherlands	0.023	[0.06]	-0.284	[0.00]	0.379	[0.33]	265
Norway	0.055	[0.03]	-0.522	[0.07]	-2.872	[0.02]	153
South Africa	0.019	[0.00]	-0.056	[0.33]	-1.066	[0.03]	377
Sweden	-0.023	[0.33]	-0.292	[0.00]	-0.839	[0.00]	426
Switzerland	-0.030	[0.04]	-0.175	[0.00]	-0.093	[0.54]	425
Taiwan, Province Of China	0.146	[0.00]	-0.941	[0.00]	-1.112	[0.00]	1,510
United Kingdom	0.023	[0.00]	-0.193	[0.00]	-0.091	[0.17]	2,880
United States	-0.001	[0.69]	-0.228	[0.00]	-0.371	[0.00]	9,217
Developed countries	0.011	[0.00]	-0.158	[0.00]	-0.306	[0.00]	25,501
Developing countries	0.021	[0.00]	-0.297	[0.00]	-0.611	[0.00]	7,353

Robustness Tests

- ◎ Results by industry
 - R&D and CapEx cluster by industry group
 - Less intra-industry variation
- ◎ Results by Size Quintiles
- ◎ Firms with consolidated accounts
 - Companies without consolidated accounts could hide debt in a subsidiary that is not being consolidated
 - Filter on observations where subsidiaries of any type, significant or not, domestic and foreign, are consolidated
 - Rajan and Zingales (JF 1995)
- ◎ Disclosure
 - Firms reporting under U.S. GAAP, IAS/IFRS, U.S. firms, as well as firms in EU countries, Australia, and South Africa after 2005
 - Fixed effects for accounting standard

Robustness Tests

- ◎ Smaller set of control variables
 - Drop four variables that have largest effect on sample size
 - N increases from 32,854 to 128,492
- ◎ Unidentified Time-invariant or Transitory Components of Leverage
 - Lemmon, Roberts and Zender (JFE 2008) find that coefficients decline on average by 60-80% when including firm fixed effects and serially correlated errors
 - Approach cannot identify what is responsible for the majority of the variation in leverage ratios since it removes the cross-sectional variation and autocorrelation in leverage
 - Estimation of leverage equation with firm fixed effects and lagged leverage
 - Main coefficients are reduced, but only modestly
- ◎ Clustering of Standard Errors
 - Petersen (RFS 2009)
 - Cluster by firm, country, industry, year (and permutations)
 - Results are insensitive to these variations

Robustness Tests

- ◎ Large vs. small plan sponsors
 - Split sample by PBO/Total Assets or Funding Level/Total Assets
- ◎ R&D intensive firms may sponsor very small benefit plans (e.g. for key employees), whereas the capital expenditure intensive firms are sponsoring much larger plans
 - Sort by R&D or CapEx and measure PBO/Total Assets or PBO/Employees
- ◎ Analysis of U.S. firm using CRSP and Compustat

Summary and Conclusion

- ⊙ Corporate post-retirement plans are economically important
 - Frequent and sizable in many countries
 - Often underfunded but not fully reflected on balance sheet
- ⊙ Consolidating DB plans increases leverage by 32%
 - Not important for gearing of firms in about half the sample countries
 - Firms with large plans have less regular leverage
 - Substitution effect varies significantly across countries (0%-100%)
- ⊙ 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>

Prof. Dr. Söhnke M. Bartram

Department of Finance

Warwick Business School

Warwick University

Coventry CV4 7AL

United Kingdom

Phone: +44 (24) 7657 4168

Fax: +1 (425) 952 10 70

Email: <s.m.bartram@wbs.ac.uk>

Internet: <<http://go.warwick.ac.uk/sbartram/>>

Research: <http://papers.ssrn.com/sol3/cf_dev/AbsByAuth.cfm?per_id=260018>