# Internet Appendix to "Threshold Events and Identification: A Study of Cash Shortfalls"*

This appendix contains supplementary tables and figures that present robustness checks mentioned in the article but not included in the tables and figures. The captions to the tables and figures describe each robustness check. A brief categorization follows. Details of the contents of each table and figure are explained in the captions.

- Figures IA.1 and IA.2 contain robustness checks for Figure 2.

- Figure IA.3 contains a robustness check for Figure 3.

- Figure IA.4 contains a robustness check for Figure 4.

- Figures IA.5 through IA.7 contain omitted results from Figures 5 through 7.

- Figures IA.8 through IA.11 contain robustness checks for Figures 5 through 7.

- Table IA.I contains extra regressions for Table II.

- Table IA.II contains an alternative version of Table III.
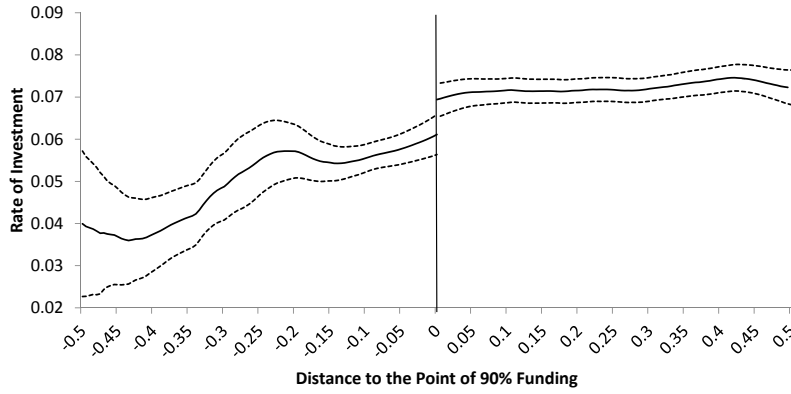
Panel A: Full sample regressions
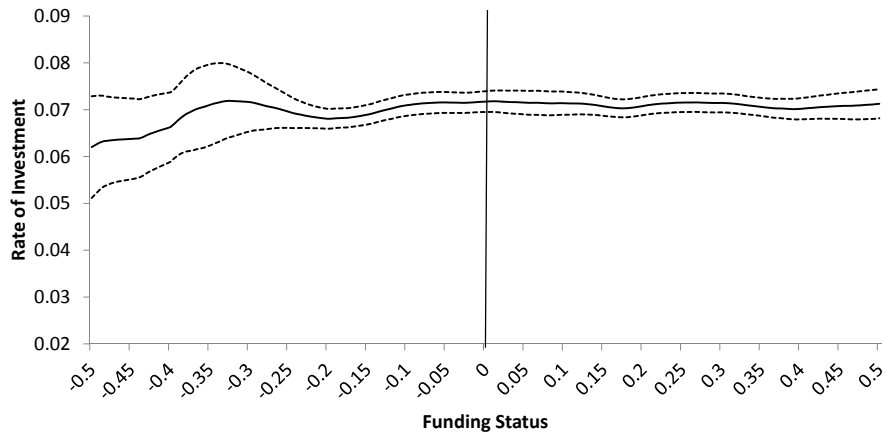
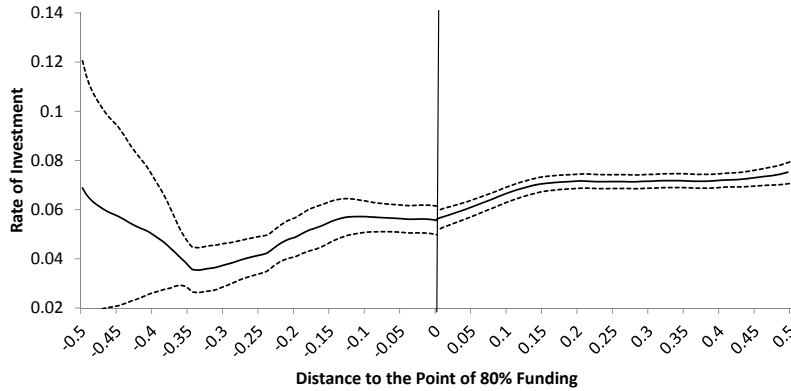Panel B: Regressions to the left and right of zero funding status
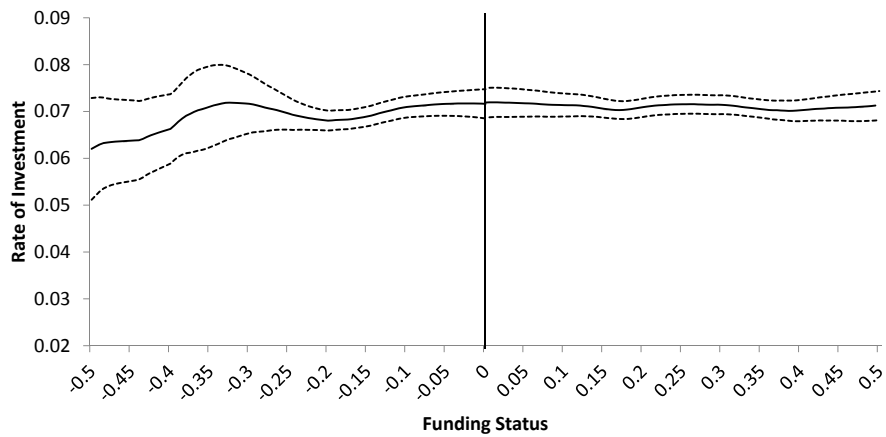
Figure IA.1. Kernel regressions with fixed effects. Calculations are based on a sample of firms from Compustat from 1990 to 1998. Both panels plot the univariate relation between investment (vertical axis) and funding status (horizontal axis). These calculations correspond to those in Figure 2, except that the regressions include fixed effects. The kernel regression estimation is performed using an Epanechnikov kernel, with a bandwidth of 0.1. In Panel A one regression is done for the full sample. In Panel B separate regressions are performed for positive and negative funding statuses. Dotted lines indicate 5% confidence bounds. The results show a small discontinuity at the point of zero underfunding within the 5% confidence bounds.
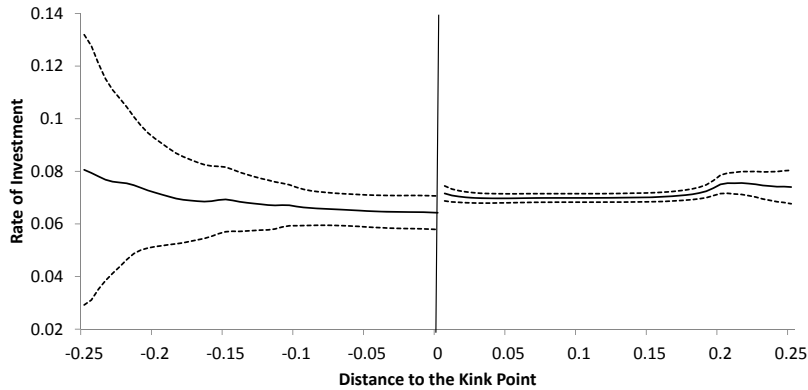
Panel A: Regressions to the left and right of the 90% funding point

Panel B: Regressions to the left and right of the 80% funding point


Panel B: Regressions to the left and right of the kink

Figure IA.2. Kernel regressions at various funding points. Calculations are based on a sample of firms from Compustat from 1990 to 1998. Both panels plot the univariate relation between investment (vertical axis) and funding status (horizontal axis). Separate regressions are performed for points to the left and right of the relevant funding point. These calculations correspond to those in Figure 2, Panel B, except that the discontinuity points examined are 90% funding, 80% funding, and the kink point at which the DRC equals the MFC. The kernel regression estimation is performed using an Epanechnikov kernel, with a bandwidth of 0.1. Dotted lines indicate 5% confidence bounds. The results show small discontinuities at the three funding points, all of which are within the 5% confidence bounds.

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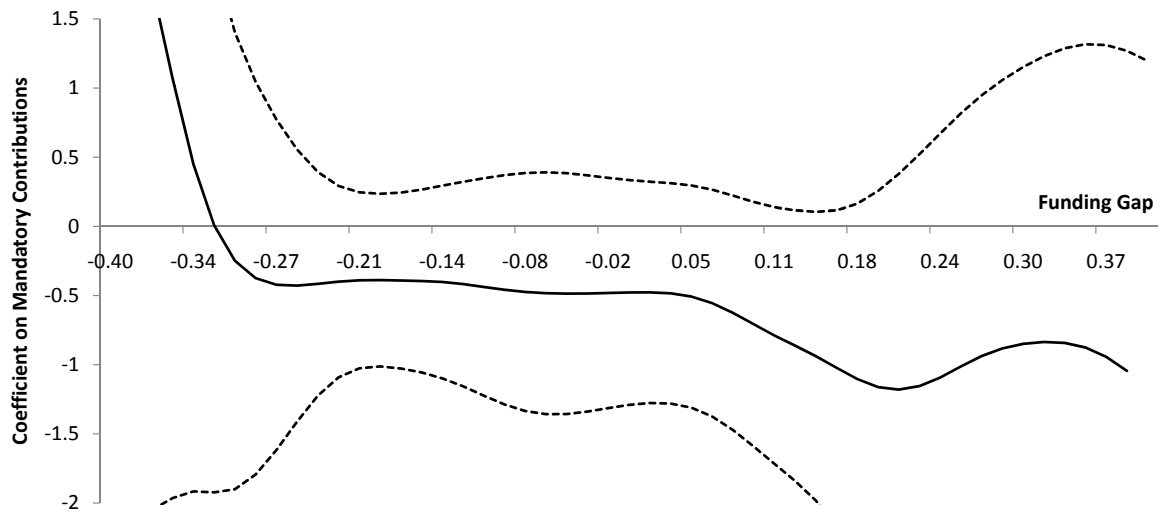
Figure IA.3. Kernel regression of investment on mandatory contributions. Calculations are based on a sample of firms from Compustat from 1990 to 1998. The regression estimated is the ratio of investment to assets on the market-to-book ratio, the ratio of cash flow to assets, the ratio of mandatory contributions to assets, and the distance to the point of zero underfunding. The smoothing is done over the gap between pension assets and liabilities, with this difference scaled by pension liabilities. A Gaussian kernel with a cross validated bandwidth of 0.065 is used. The dotted lines indicate 5% confidence bands calculated with clustered standard errors. This figure corresponds to Figure 3, except that here clustered standard errors are used. The results indicate no significant effect on investment.

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Distance from the Kink Point
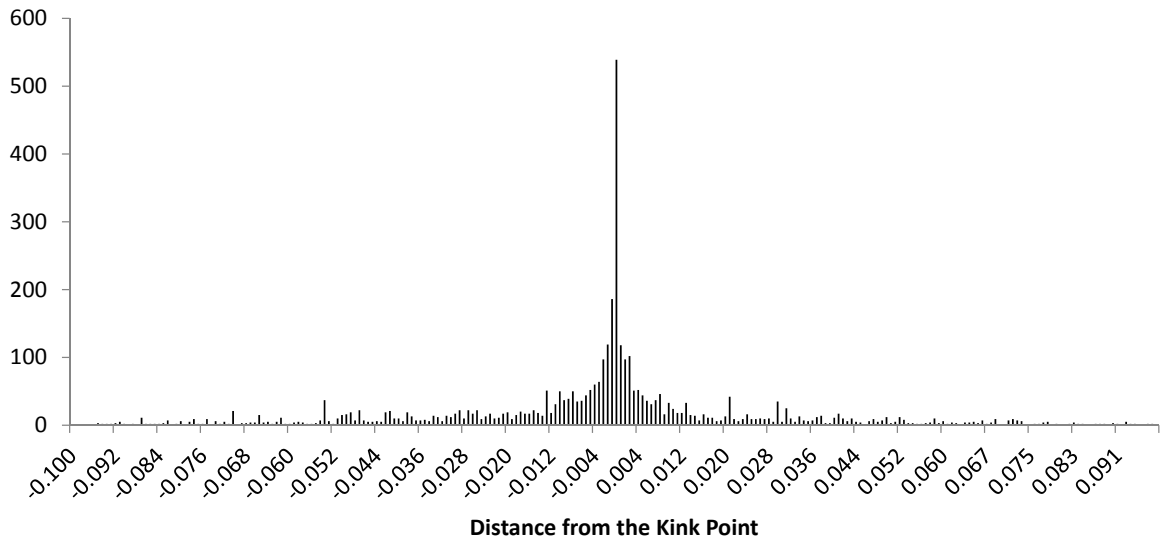
Figure IA.4. Density of the distance to the kink. Calculations are based on a sample of firms from Compustat from 1990 to 1998. The kink is defined as the level of plan assets at which the DRC equals the MFC. (In the case of more than one plan, it is defined as the minimum kink.) The distance to the kink is the kink minus the pension gap, which is defined as the minimum plan surplus if all of the plans in a firm have a surplus and as the sum of the deficits if at least one of a firm's plans has a deficit. This figure depicts a histogram of kink distances as a fraction of total pension liabilities, and it is a robustness check for Figure 4.
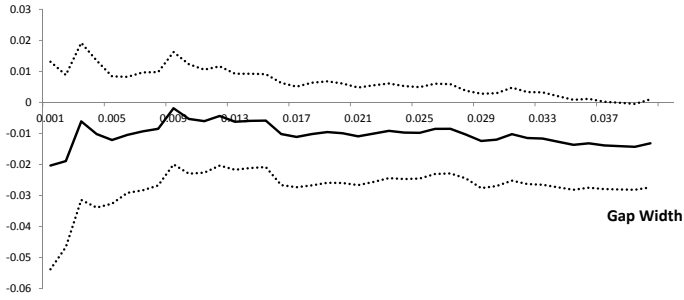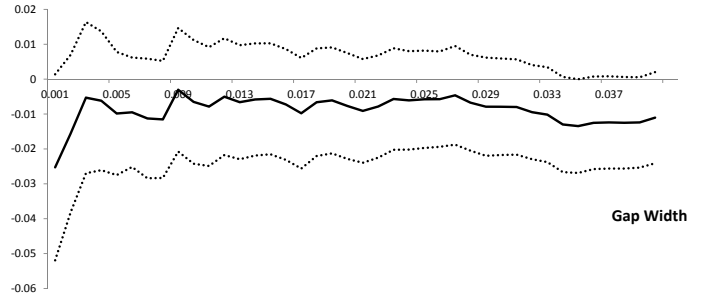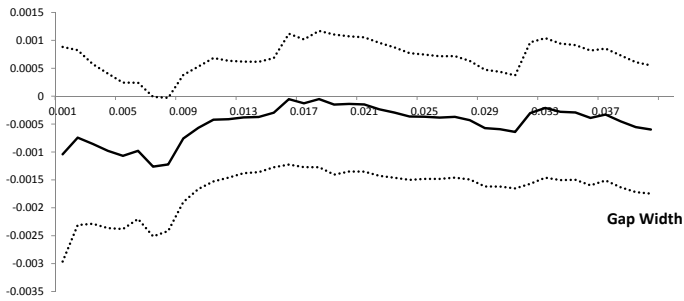
Advertising
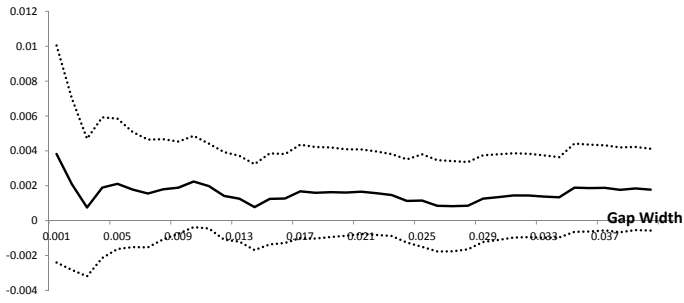
Cash
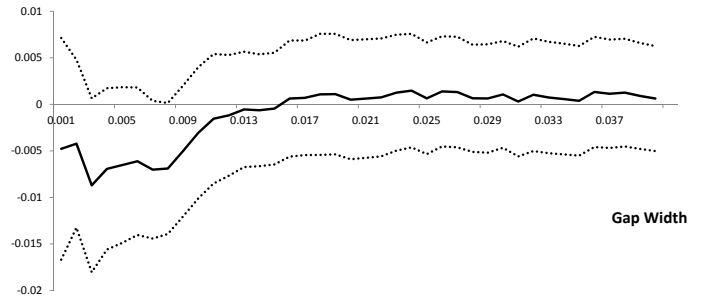
Leverage

Total Debt Issuance

Dividends

Change in Working Capital
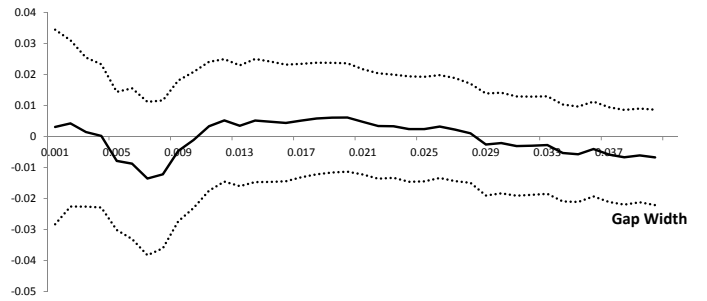
Sales of Capital Goods
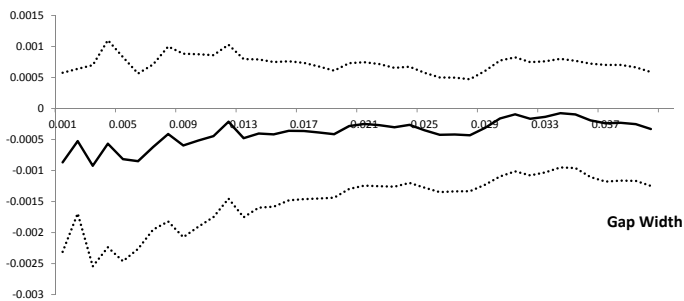
Saving
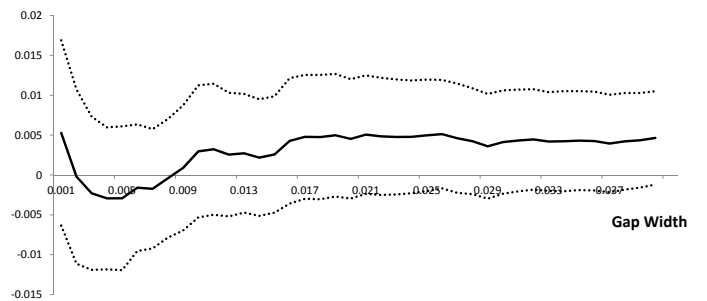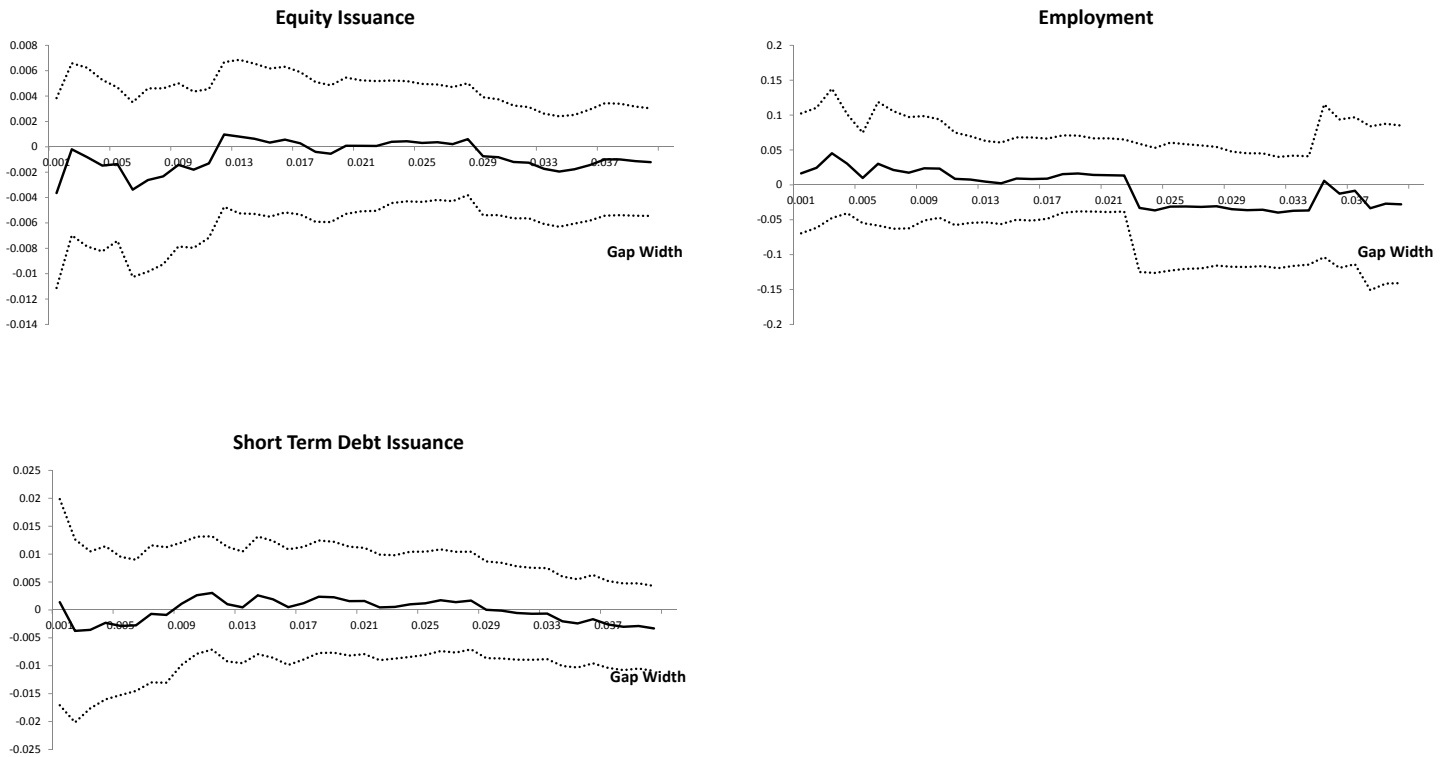
Figure IA.5. Local responses to funding violations. This figure contains all of the insignificant results omitted from Figure 5. Calculations are based on a sample of firms from Compustat from 1990 to 1998. Each panel in this figure plots regression coefficients from 40 regressions as a function of the sample used for the estimation. Each panel is labeled by the dependent variable in the regression. The regressors are a pension violation indicator and firm and time fixed effects, and the coefficient of interest is that on the violation indicator. On the horizontal axis is a measure of the sample used for estimation, which is the absolute value of the pension gap as a fraction of plan assets. The pension gap is defined as the minimum plan surplus if all of the plans in a firm have a surplus and as the sum of the deficits if at least one of a firm's plans has a deficit. The sample used for the calculation is all observations for which the absolute value of the pension gaps is less than the specified value on the horizontal axis. All dependent variables except employment are expressed as a fraction of total assets. Employment is measured as the natural log of millions of employees.

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Advertising

Cash

Leverage

Total Debt Issuance

Dividends

Employment
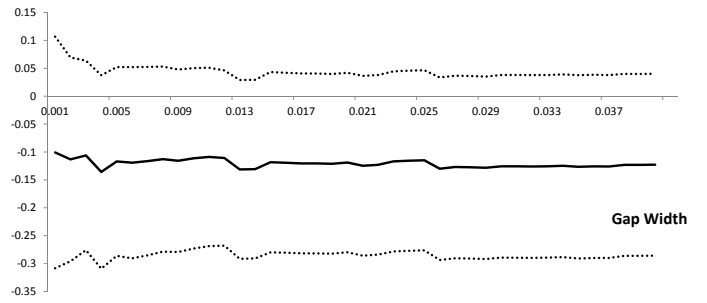
Inventories

Sales of Capital Goods

R & D

Saving

Short Term Debt Issuance
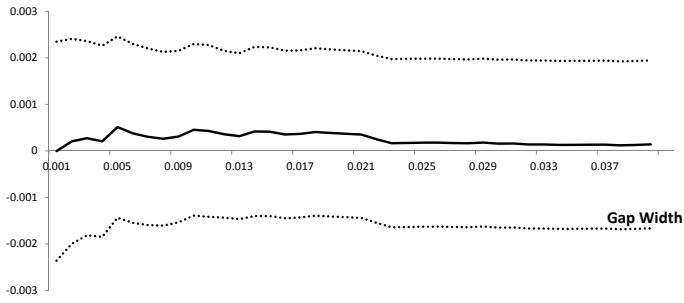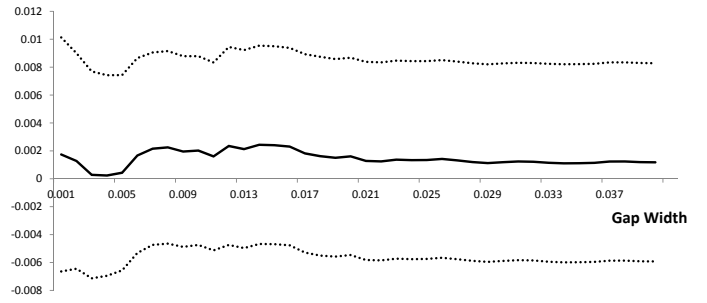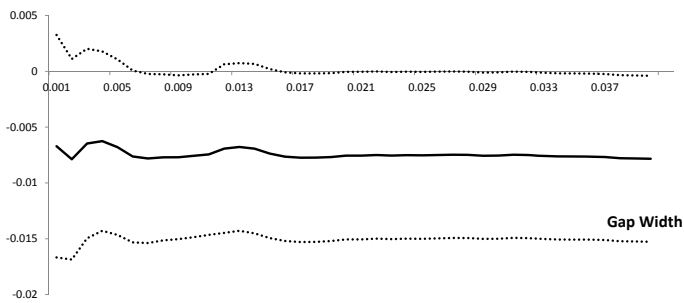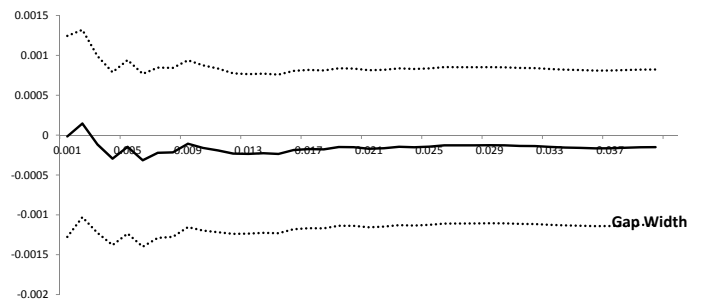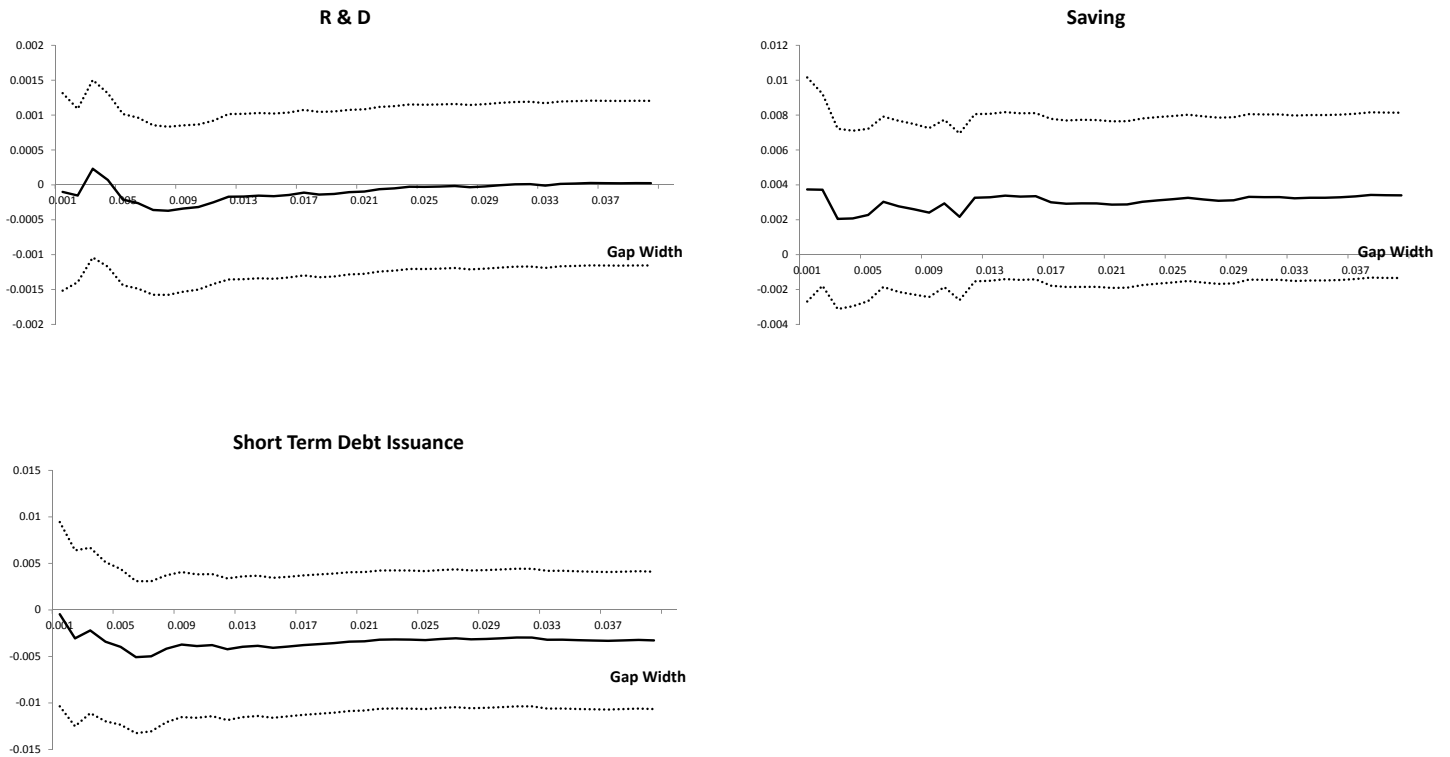

Figure IA.6. Local responses to 10% underfunding. This figure contains all of the insignificant results omitted from Figure 6. Calculations are based on a sample of firms from Compustat from 1990 to 1998. Each panel in this figure plots regression coefficients from 40 regressions as a function of the sample used for the estimation. Each panel is labeled by the dependent variable in the regression. The regressors are a pension violation indicator and firm and time fixed effects, and the coefficient of interest is that on the violation indicator. On the horizontal axis is a measure of the sample used for estimation, which is the absolute value of the pension gap as a fraction of plan assets. The pension gap is defined as the minimum plan surplus if all of the plans in a firm have a surplus and as the sum of the deficits if at least one of a firm's plans has a deficit. The sample used for the calculation is all observations for which the absolute value of the pension gaps is less than the specified value on the horizontal axis. All dependent variables except employment are expressed as a fraction of total assets. Employment is measured as the natural log of millions of employees.
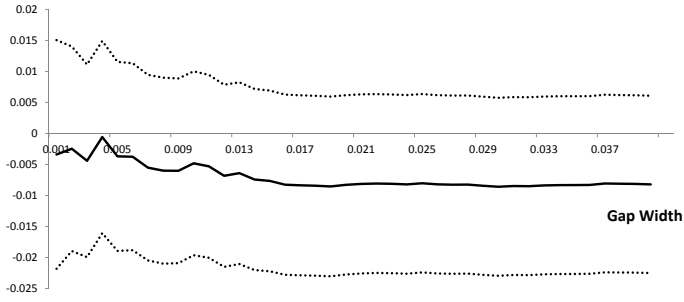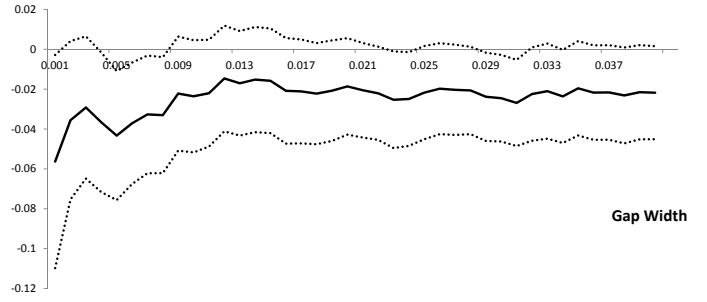
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0.004
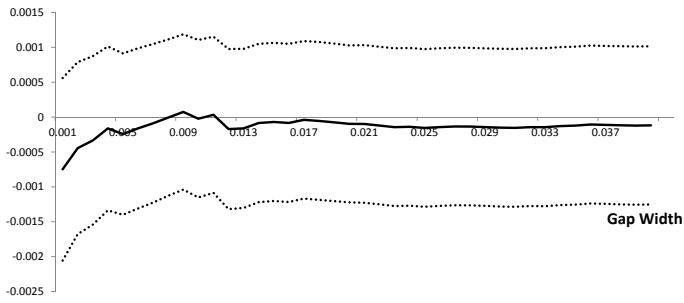0.003
0.002
0.001
0
-0.001
-0.002
-0.003

0.001   0.005   0.009   0.013   0.017   0.021   0.025   0.029   0.033   0.037

Gap Width

Leverage

0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04

0.001   0.005   0.009   0.013   0.017   0.021   0.025   0.029   0.033   0.037

Gap Width

Change in Employment

0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
-0.07
-0.08

0.001   0.005   0.009   0.013   0.017   0.021   0.025   0.029   0.033   0.037

Gap Width

Total Debt Issuance

0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05

0.001   0.005   0.009   0.013   0.017   0.021   0.025   0.029   0.033   0.037

Gap Width

Dividends

0.0025
0.002
0.0015
0.001
0.0005
0
-0.0005
-0.001
-0.0015
-0.002

0.001   0.005   0.009   0.013   0.017   0.021   0.025   0.029   0.033   0.037

Gap Width

Equity Issuance

0.004
0.002
0
-0.002
-0.004
-0.006
-0.008
-0.01
-0.012
-0.014

0.001   0.005   0.009   0.013   0.017   0.021   0.025   0.029   0.033   0.037

Gap Width

Employment

0.3
0.2
0.1
0
-0.1
-0.2
-0.3

0.001   0.005   0.009   0.013   0.017   0.021   0.025   0.029   0.033   0.037

Gap Width

Inventories

0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
-0.07
-0.08

0.001   0.005   0.009   0.013   0.017   0.021   0.025   0.029   0.033   0.037

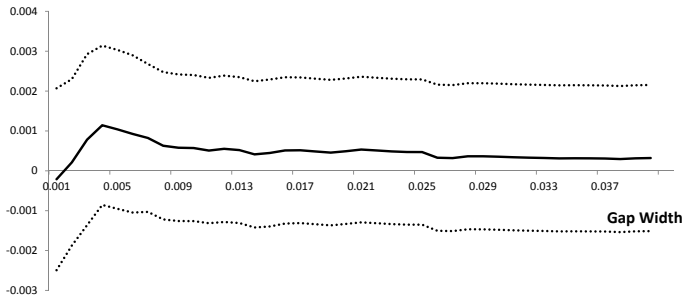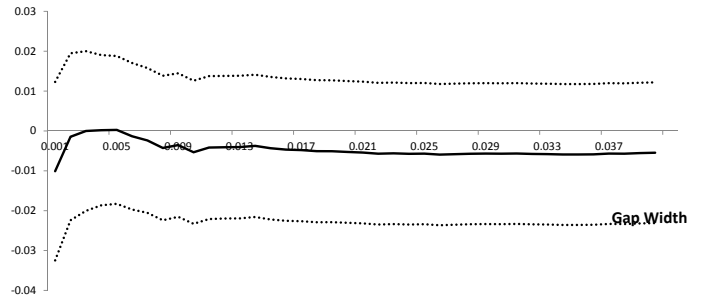Gap Width

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Figure IA.7. Local responses to 20% underfunding. This figure contains all of the insignificant results omitted from Figure 7. Calculations are based on a sample of firms from Compustat from 1990 to 1998. Each panel in this figure plots regression coefficients from 40 regressions as a function of the sample used for the estimation. Each panel is labeled by the dependent variable in the regression. The regressors are a pension violation indicator and firm and time fixed effects, and the coefficient of interest is that on the violation indicator. On the horizontal axis is a measure of the sample used for estimation, which is the absolute value of the pension gap as a fraction of plan assets. The pension gap is defined as the minimum plan surplus if all of the plans in a firm have a surplus and as the sum of the deficits if at least one of a firm's plans has a deficit. The sample used for the calculation is all observations for which the absolute value of the pension gaps is less than the specified value on the horizontal axis. All dependent variables except employment are expressed as a fraction of total assets. Employment is measured as the natural log of millions of employees.
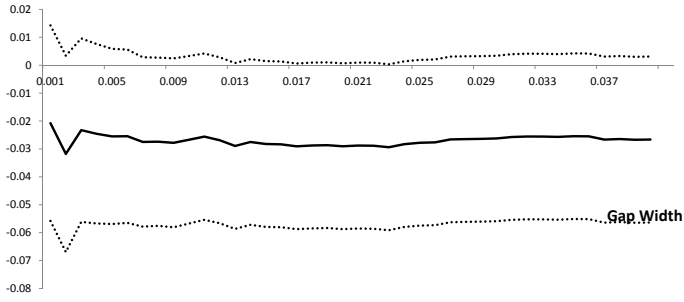
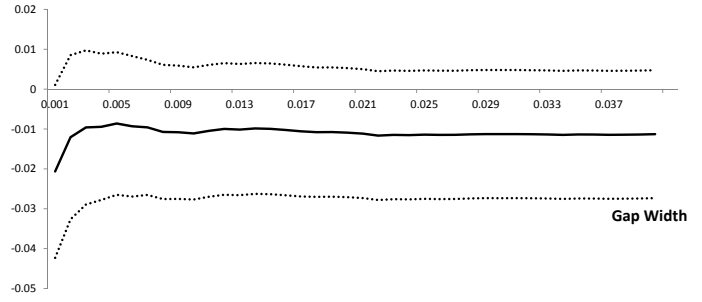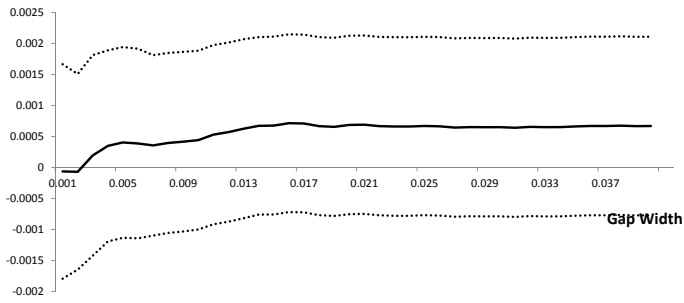**Figure IA.8. Local responses to underfunding.** This figure is identical to Figure 5, except that the local linear regressions also include cash flow as a regressor. Calculations are based on a sample of firms from Compustat from 1990 to 1998. Each panel in this figure plots regression coefficients from 40 regressions as a function of the sample used for the estimation. Each panel is labeled by the dependent variable in the regression. The regressors are a pension violation indicator and firm and time fixed effects, and the coefficient of interest is that on the violation indicator. On the horizontal axis is a measure of the sample used for estimation, which is the absolute value of the pension gap as a fraction of plan assets. The pension gap is defined as the minimum plan surplus if all of the plans in a firm have a surplus and as the sum of the deficits if at least one of a firm's plans has a deficit. The sample used for the calculation is all observations for which the absolute value of the pension gaps is less than the specified value on the horizontal axis. All dependent variables except employment are expressed as a fraction of total assets. Employment is measured as the natural log of millions of employees.

Figure IA.9. Local responses to underfunding. This figure is identical to Figure 5, except that the local linear regressions also include the distance to the point of underfunding flow as a regressor. Calculations are based on a sample of firms from Compustat from 1990 to 1998. Each panel in this figure plots regression coefficients from 40 regressions as a function of the sample used for the estimation. Each panel is labeled by the dependent variable in the regression. The regressors are a pension violation indicator and firm and time fixed effects, and the coefficient of interest is that on the violation indicator. On the horizontal axis is a measure of the sample used for estimation, which is the absolute value of the pension gap as a fraction of plan assets. The pension gap is defined as the minimum plan surplus if all of the plans in a firm have a surplus and as the sum of the deficits if at least one of a firm's plans has a deficit. The sample used for the calculation is all observations for which the absolute value of the pension gaps is less than the specified value on the horizontal axis. All dependent variables except employment are expressed as a fraction of total assets. Employment is measured as the natural log of millions of employees.
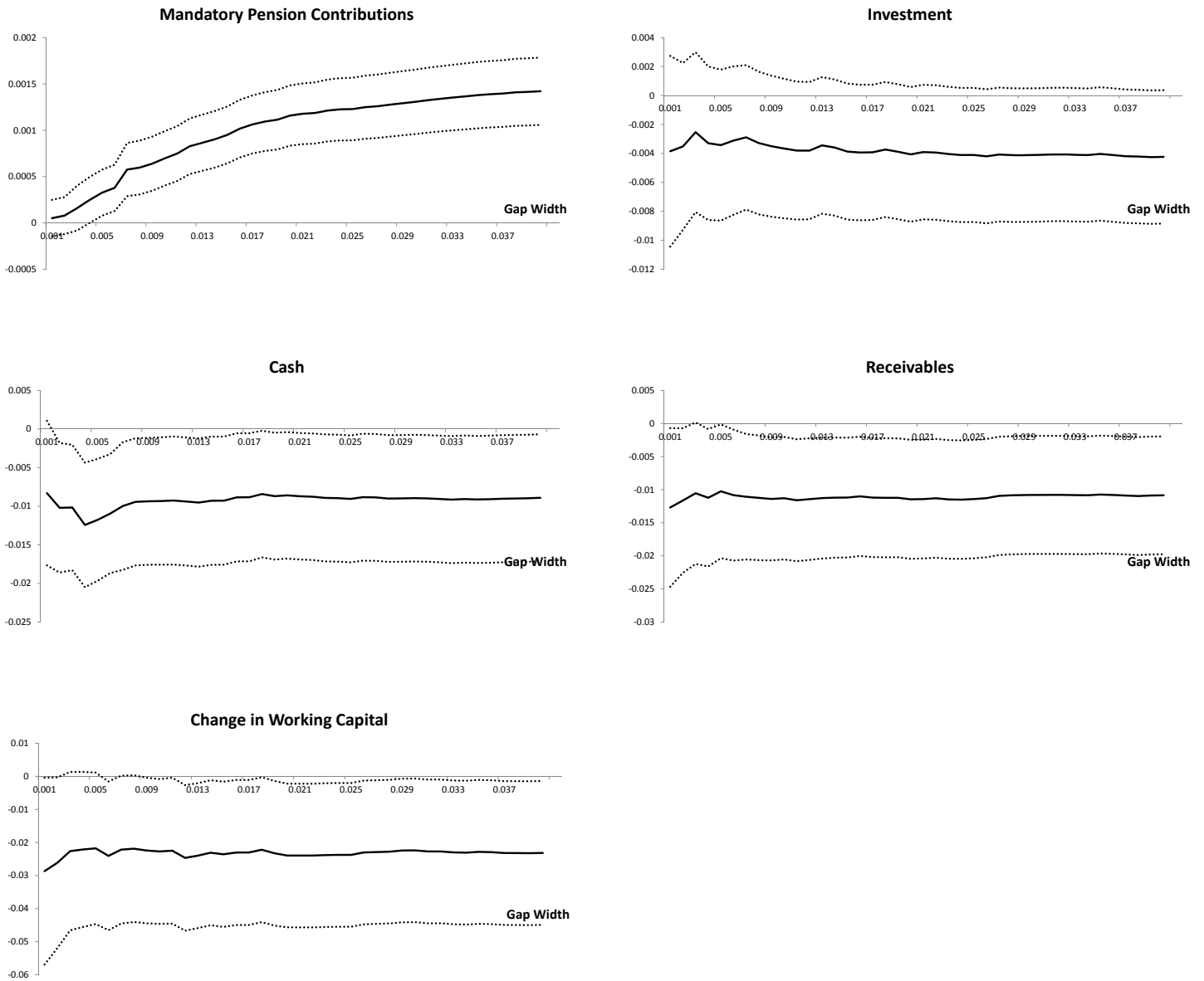
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Figure IA.10. Local responses to 10% underfunding. This figure is identical to Figure 6, except that the local linear regressions also include the distance to the point of underfunding flow as a regressor. Calculations are based on a sample of firms from Compustat from 1990 to 1998. Each panel in this figure plots regression coefficients from 40 regressions as a function of the sample used for the estimation. Each panel is labeled by the dependent variable in the regression. The regressors are a pension violation indicator and firm and time fixed effects, and the coefficient of interest is that on the violation indicator. On the horizontal axis is a measure of the sample used for estimation, which is the absolute value of the pension gap as a fraction of plan assets. The pension gap is defined as the minimum plan surplus if all of the plans in a firm have a surplus and as the sum of the deficits if at least one of a firm's plans has a deficit. The sample used for the calculation is all observations for which the absolute value of the pension gaps is less than the specified value on the horizontal axis. All dependent variables except employment are expressed as a fraction of total assets. Employment is measured as the natural log of millions of employees.

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Mandatory Pension Contributions

Investment

Cash

Receivables

Change in Working Capital

Figure IA.11. Local responses to 20% underfunding. This figure is identical to Figure 7, except that the local linear regressions also include the distance to the point of underfunding flow as a regressor. Calculations are based on a sample of firms from Compustat from 1990 to 1998. Each panel in this figure plots regression coefficients from 40 regressions as a function of the sample used for the estimation. Each panel is labeled by the dependent variable in the regression. The regressors are a pension violation indicator and firm and time fixed effects, and the coefficient of interest is that on the violation indicator. On the horizontal axis is a measure of the sample used for estimation, which is the absolute value of the pension gap as a fraction of plan assets. The pension gap is defined as the minimum plan surplus if all of the plans in a firm have a surplus and as the sum of the deficits if at least one of a firm's plans has a deficit. The sample used for the calculation is all observations for which the absolute value of the pension gaps is less than the specified value on the horizontal axis. All dependent variables except employment are expressed as a fraction of total assets. Employment is measured as the natural log of millions of employees.

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Table IA.I
Extra Subsample Regressions

Estimates are from a sample of unregulated and nonfinancial firms from the 2007 Compustat annual industrial files. The sample period is 1990 to 1998. Pension data are from IRS Form 5500. MPCs are mandatory pension contributions to underfunded plans, scaled by total assets. Funding status is the average across plans of pension assets minus pension liabilites, as a fraction of total assets. Funding gap is the smallest funding gap if all plans have positive gaps, and the sum of the negative gaps if any plans have negative gaps. Nonpension cash flow is income plus depreciation plus pension expense, all scaled by total assets. The kink is defined as the level of plan assets at which the DRC equals the MFC. All regressions contain fixed firm and year effects. Standard errors are in parentheses and are corrected for heteroskedasticity and clustering at the firm level.

	Full Sample	Above the Kink	Below the Kink
Market-to-Book	0.019	0.022	0.018
	(0.002)	(0.003)	(0.002)
Nonpension Cash Flow	0.113	0.104	0.117
	(0.011)	(0.016)	(0.015)
MPCs	-0.624	-0.689	-0.537
	(0.268)	(0.503)	(0.456)
Funding Gap	0.038	0.039	0.056
	(0.020)	(0.023)	(0.083)
R^2 (within)	0.101	0.115	0.100
R^2	0.684	0.697	0.683
Sample Size	7889	4002	3879

Table IA.II
Summary Statistics by Average Funding Status

The figures presented are means from a sample of unregulated and nonfinancial firms from the 2007 Compustat annual industrial files. The sample period is 1990 to 1998. Pension data are from IRS Form 5500. Mandatory Contributions are federally mandated contributions to a pension plan with assets less than liabilities. Total Contributions are mandatory plus voluntary contributions. Plan Violation Indicator equals one if the firm is making mandatory pension contributions, and zero otherwise. Average Funding Status is the average across plans of pension assets minus pension liabilites, as a fraction of total firm assets. "In Violation" indicates that average funding status is less than zero. Average Funding Status indicator is one if average funding status is positive, and zero otherwise. Funding Gap is the smallest funding surplus if all plans are running surpluses, and the sum of the deficits if any plans are running deficits. Bond Rating is a dummy variable that takes a value of one if a firm has an S&P long-term bond rating, and zero otherwise. All variables except employment are deflated by total book assets.

	Full Sample	In Violation	Not in Violation	< 90% Funded	< 80% Funded
Total Assets	3,418	2,612	3,643	2,378	2,107
Average Funding Status Indicator	0.218	1.000	0.000	1.000	1.000
Plan Violation Indicator	0.351	1.000	0.170	1.000	1.000
Average Funding Status	0.036	-0.016	0.050	-0.025	-0.030
Funding Gap	0.015	-0.017	0.024	-0.026	-0.031
Total Contributions	0.003	0.007	0.002	0.008	0.008
Pension Assets	0.143	0.119	0.149	0.111	0.083
Pension Liabilities	0.106	0.134	0.098	0.138	0.124
Mandatory Contributions	0.001	0.004	0.000	0.005	0.006
Investment	0.069	0.063	0.071	0.057	0.055
Cash Flow	0.096	0.079	0.101	0.068	0.057
Nonpension Cash Flow	0.100	0.086	0.103	0.077	0.068
Market-to-Book	1.481	1.420	1.499	1.369	1.362
R&D	0.017	0.017	0.017	0.017	0.016
Advertising	0.012	0.011	0.012	0.010	0.008
Debt-to-Assets	0.249	0.275	0.242	0.283	0.287
Bond Rating	0.411	0.315	0.437	0.255	0.182
Short Term Debt Issuance	0.005	0.005	0.006	0.005	0.000
Long Term Debt Issuance	0.021	0.023	0.021	0.022	0.030
Saving	0.004	0.003	0.004	0.004	0.004
Cash	0.070	0.070	0.070	0.074	0.079
Dividends	0.019	0.011	0.021	0.010	0.011
Common Dividends per Share	0.615	0.338	0.693	0.282	0.269
Equity Issuance	0.012	0.015	0.012	0.016	0.017
Equity Repurchases	0.012	0.010	0.012	0.008	0.007
Employment % Change	0.808	0.312	0.947	-1.719	-3.083
Earnings	0.042	0.025	0.047	0.014	0.006
Z-Score	2.780	2.012	2.995	1.651	1.609