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How and Why Do Operating Firms Participate in Swap Markets?

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Motivation

- **Observation:** No widespread consensus on why and how firms hedge, especially during periods of financial distress
- **Challenges:**
  - *Misconceptions about risk*: Cannot eliminate risk: transform unacceptable risks into acceptable through risk management
  - *Financial risk can be hedged* due to the existence of large, efficient markets through which these risks can be transferred
  - *Firm constraints*: cost of hedging, board approval, etc.
  - No standardization for reporting/decentralized markets
  - GAAP and accounting treatment derivative gains/losses

Motivation

- **No Hedging Benefits:** Firms are rewarded for taking risks associated with primary business activities: product development, manufacturing and marketing
- **Hedging Benefits:** Firms are not rewarded for taking risks which are not central to basic business: e.g., interest rate, exchange rate, and commodity price input risk
  - Opting not to hedge financial risk is de facto position that the markets will either remain static or move in a favorable direction
- **Tradeoff:** Unless the potential loss is material, i.e., large enough to severely impact corporate earnings, the benefits of hedging may not outweigh the costs
  - Corporation may be better off not hedging

Research Question

- **How and why do firms make the hedging decision?**
  - Prior theory: (M&M, S&S)
  - Recent surveys: Giambona et al. (2018)
    - Problem? Self-Selection
  - Swap use as a proxy for the hedging decision
    - CFTC SDRs (DTCC)
    - Financing & Risk Management: Credit Risk / Financial Risk
  - Empirical design for endogeneity
    - Probit
    - Regression Discontinuity (Sharp/Fuzzy)

Benefits of Hedging

1. **Risk Shifting**: Smith and Stulz (1985); Stulz (1990)
   - Risk averse stakeholders (non-diversifiable) require extra compensation to bear non-owner/non-hedged
2. **Taxes**: Mayers and Smith (1982); Smith and Stulz (1985); Graham and Smith (1999)
   - Hedging increases post-tax cash flows/firm value from reduced expected tax liability | convex MTRs & concave post-tax payoffs
3. **Underinvestment:** Myers (1997); Stulz (1984)
   - Higher leverage => rejection of positive NPV due to value transfer from equity to debt holders
   - Hedging increases debt capacity (perhaps preferable to lower leverage)
4. **Overinvestment:** Morellec and Smith (2004); Jensen (1986)
   - Hedging => (+) firm value by controlling FCF and avoiding overinvestment
   - Firms generating FCF require higher leverage to commit to distribution & avoid value destruction
5. **Asymmetric Information:** Froot, Sharfstein, and Stein (1993); Myers and Majluf (1984)
   - Hedging can increase firm value by avoiding costly external financing
   - Hedging benefits greatest for firms with high information asymmetry (managers, investors)

Costs of Hedging

- **Implied and Explicit Costs:**
  - Out-of-Pocket fees, commissions
  - Bid-ask spread
  - Opportunity cost of management's focus/time for administration
- **"Recent" Developments:** Central clearing, standardization, and increased usage of financial instruments
- **Tradeoff:** Cost of hedging should incorporate implicit cost of not hedging (doing nothing is taking a position)

Summary of Findings

- Stylized facts
  - Robust set of hedging determinants for swaps
  - Swap markets characteristics absent in the literature
- Results show that larger (+), levered (+), older firms (+), intangible assets (-), and foreign profits (+) for swaps
- RDD around discrete credit risk and continuous financial risk thresholds show:
  - **Firms that with (+) financing access => (-) hedging, ceteris paribus, except those firms with limited access to external public debt markets**
  - **Firms transitioning from (-) to (+) profits => (-) hedging, ceteris paribus**
  - Marginal effects and significance of additional covariates are broadly similar to a generic Probit estimation
  - **Differences between the hedging decision and extent of hedging**

Literature

- Hedging, Speculation, Market Timing
  - Allayannis and Ofek (2001), Guay and Kothari (2003), Faulkender (2005), Giambona et al. (2018)
- Size and Hedging (+)
  - Bodnar et al. (1995), Geczy, Minton, and Schrand (1999), Tufano (1996), Campello et al. (2011)
- Growth (+/-)
  - Nance et al. (1993) [+]; Mian (1994), Geczy et al. (1999) [+/-]; Morellec and Smith (2004) [+]
- Financial Distress (+*)
  - Booth et al. (1994), Mayers and Smith (1990), Campello et al. (2011)
  - Purnanandam (2008) [+*]
- Taxes (+)
  - Campello et al. (2011)
- Managers (+)
  - Tufano (1996), Guay and Kothari (2003), Giambona et al. (2018)

Endogeneity

How does financial risk affect firms' decision to use swaps?

1. **Simultaneity:** Risk Management is Endogenous with Financing Policy
   - (<=) Leverage determines hedging:
     - Airlines closer to financial distress increase hedging (Giambona and Wang (2020))
   - (=>) Hedging determines leverage:
     - Lin and Smith (2007): hedging allows firms to increase their debt capacity (firms that use IRS and FX have higher leverage)
2. **Omitted Characteristics:** There are many firm characteristics that impact firm hedging decisions.
   - Lel (2012): strongly governed firms use derivatives to hedge currency exposure and overcome costly external financing
3. **Measurement Error:** It is hard to measure determinants of hedging and the hedging decision itself

   Firms could use multiple forms of hedging: operations (real options, market segments, geographical), use of financial instruments, disclosure requirements

Additional Challenge

How do we measure firm default risk for financial distress costs?

Credit Rating

- Excellent proxy and incorporates more than just financial leverage
- Problem: limited number of firms with credit ratings

Debt/EBITDA

- Debt (net of cash) / EBITDA
- **This is what firms pay the most attention to for leverage!**
  - Graham (2022) – most important measure (far more than traditional book leverage measures)
  - Extremely important for private debt

Model

- Probit
- Regression Discontinuity Design (RDD)
  - Sharp
    - Ind $[SU_{it} = \beta_0 + \beta_1 T_{it} + \beta_2 DTC_{it} + \varepsilon_{it}] \geq 0$
      - T= 1 if firm i is treated based on cutoff rule, and 0 otherwise
  - Fuzzy
    - Stage 1: D_i = Ind $[\gamma_0 + \gamma_1 T_i \ \gamma_2 DTC_i \ + \pi_1(Debt/EBITDA_i) + \eta_i] \geq 0$
    - SU_i = Ind $[\beta_0 + \beta_1 D_i + \beta_2 DTC_i + \pi_2(Debt/EBITDA_i) + \varepsilon_i] \geq 0$
      - D = 1 if firm i receives treatment, and 0 otherwise
      - T= 1 if firm i is assigned to treatment based on cutoff rule, and 0 otherwise

Data

- **Universe of Swap End-Users:**
  - Screen all swap users on 2nd Friday of every quarter
    - 12 quarters: 2018 Q1 – 2020 Q4
    - IRS, FX, CDS/CDX, Commodity Swaps (COM), Equity Swaps (EQ)
    - Map the entity LEI to the parent LEI to identify end-users
    - Identify end-users in S&P500, S&P400, S&P600
- **Universe of Public Firms**
  - All public firms in Compustat-CRSP (major index identifiers)
  - Exclude utilities and financials from regression models
- **Match using CIK**
  - SEC-CIK link table
- **Other Data:**
  - S&P Issuer Credit Ratings, S&P Index Indicator, LPC Dealscan, I/B/E/S

Swap Users vs. Non-Users*

	User			Non-User			Difference	
Variables	N	Mean	SD	N	Mean	SD	T-Stat	P-Value
Size	2841	8.25	1.65	4666	5.48	1.85	77.04	0.00
Market-to-Book	2836	3.83	8.00	4662	4.38	8.79	-5.84	0.00
CapEx	2840	0.04	0.04	4656	0.03	0.04	9.32	0.00
Prop. Plant & Equip.	2840	0.29	0.25	4662	0.19	0.22	12.11	0.00
Profitability	2833	0.14	0.41	4161	-0.99	2.41	30.53	0.00
Book Leverage	2833	0.61	0.25	4643	0.47	0.34	25.37	0.00
Firm Age	2839	3.03	0.97	4630	2.30	1.09	32.03	0.00
R&D	2833	0.04	0.11	4162	0.41	0.77	-30.66	0.00
R&D Indicator	2841	0.39	0.49	4666	0.27	0.45	16.67	0.00
Selling Expense	2833	0.22	0.24	4162	0.67	1.45	-20.13	0.00
Foreign Profits	2841	0.31	0.38	4662	0.09	0.24	23.90	0.00
HHI	2841	6.86	0.57	4666	6.78	0.48	-3.89	0.00
Dividend Payer	2841	0.56	0.50	4666	0.19	0.39	39.85	0.00
Altman Z-Score	2836	3.02	3.46	4655	4.14	8.96	-12.37	0.00
OCF Volatility	2623	216.59	298.10	3807	34.49	91.47	38.72	0.00
St Debt / Total Debt	2785	0.11	0.17	3996	0.25	0.29	-11.45	0.00
Sales	2833	7.92	1.65	4162	4.91	2.47	62.39	0.00
Cash	2841	0.11	0.12	4666	0.36	0.32	-49.38	0.00
Foreign Sales	2833	0.03	0.04	4162	0.00	0.02	26.72	0.00
S&P Index Category	2820	1.41	1.23	4520	0.34	0.72	26.72	0.00
S&P Rating Indicator	2841	0.60	0.49	4666	0.12	0.33	26.72	0.00
S&P Rating	1703	11.16	3.19	561	9.07	2.75	26.72	0.00

Swap Use Determinants

Variables	(1) **Swap User**	(2) IRS User	(3) FX User	(4) CDS User	(5) COM User	(6) EQ User
Size	1.70***	1.14***	1.91***	2.15***	1.79***	2.27
	(14.04)	(12.76)	(12.71)	(3.88)	(8.19)	(1.63)
Market-to-Book	-0.01	0.00	-0.01	0.01	-0.01	0.00
	(-0.89)	(0.56)	(-0.71)	(0.40)	(-0.82)	(0.04)
CapEx	5.34**	-0.15	8.14***	11.68	4.78	8.51
	(2.52)	(-0.07)	(2.81)	(1.50)	(1.37)	(0.64)
Prop. Plant & Equip.	0.022	-0.17	-3.57***	-3.10	4.54***	-3.03
	(0.04)	(-0.31)	(-4.89)	(-1.24)	(4.38)	(-1.01)
Profitability	-0.26*	-0.33**	-0.53***	0.56	-0.61*	1.55
	(-1.65)	(-2.21)	(-3.39)	(0.35)	(-1.90)	(0.47)
Book Leverage	1.75***	1.87***	1.72***	3.44**	2.50***	2.72
	(5.27)	(5.54)	(4.89)	(2.26)	(4.35)	(1.11)
Firm Age	0.50***	-0.00	0.91***	1.61**	0.64***	0.48
	(4.91)	(-0.04)	(6.81)	(2.26)	(3.55)	(1.03)
R&D	-2.54***	-3.71***	-2.93***	-1.88	-2.97	3.24
	(-3.37)	(-2.75)	(-3.60)	(-0.39)	(-1.38)	(0.47)
R&D Indicator	-0.18	-0.16	-1.43***	0.081	0.41	-0.98
	(-0.75)	(-0.65)	(-4.49)	(0.09)	(1.07)	(-1.16)
Selling Expense	-0.47	-2.39***	-0.95**	-3.32	-0.09	-1.17
	(-1.41)	(-3.41)	(-2.36)	(-0.83)	(-0.17)	(-0.26)
Foreign Profits	0.83***	0.44**	0.98***	-0.47	-0.34	-0.26
	(4.16)	(2.38)	(4.61)	(-0.87)	(-0.98)	(-0.31)
Observations	6,907	6,916	6,916	6,916	6,744	6,539
Number of Firms	2,574	2,577	2,577	2,577	2,513	2,436
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Pseudo R-Squared	0.33	0.23	0.30	0.33	0.40	0.43

Comparison with Probit

Panel A: Cutoff$_1$ & Cutoff$_2$	**(1) Swap User** xtprobit Baseline	(2) Sharp xtprobit C_1, BW_1	(4) Sharp Xtprobit C_2, BW_1	(2) Fuzzy IV ivprobit C_1, BW_1	(3) Fuzzy IV ivprobit C_2, BW_1
Treatment		-1.01**	-0.95*	-1.34*	-1.38*
DTC		0.53***	-0.01	0.69**	0.05
Size	1.58***	1.28***	1.60***	0.33**	0.36**
Market-to-Book	-0.02	-0.01	-0.02	0.01	-0.01*
CapEx	8.17*	7.67	8.81*	0.79	0.80
Prop. Plant & Equip.	-0.07	0.21	-2.10*	-0.03	0.18
Profitability	-0.44	-0.21	-1.25	-0.06	0.01
Book Leverage	1.63**	1.90**	2.77***	0.63***	0.47*
Firm Age	0.22	0.06	0.49**	0.15*	0.03
R&D	1.65	-2.38	4.51	-0.79*	-0.56
R&D Indicator	-0.05	-0.17	-0.23	0.20	-0.09
Selling Expense	-0.51	-0.21	-1.74	0.02	-0.15
Foreign Profits	0.84**	0.78*	0.37	0.68*	0.43*
Observations	2,189	1,018	1,496	1,164	1,334
Number of Firms	809	424	574	810	871
Bandwidth	N/A	2	4	0.5	2
Industry FE	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y
Pseudo R-Squared	0.20	0.19	0.18	Y	Y

High Credit Risk | Low Credit Risk | Moderate Credit Risk | Extreme Financial Risk

Current Additions

- **Other Derivatives (options, futures, etc.)**
  - Text analytics
    - SEC 10K filings
    - Zipf's Law
- **Swap Exposure (conditional on usage)**
  - Notionals
  - Entity Netted Notionals (ENNs)

Additional Findings

Panel A: C_1 >=-0.3

	(1) Linear xtreg	(2) Linear xtreg	(3) Sharp rdrobust	(4) Sharp rdrobust	(5) Fuzzy IV ivregress	(6) Fuzzy IV ivregress	(7) Fuzzy IV ivregress
Treatment			1.34**	1.44**	1.09*	1.32**	1.14**
DTC			-	-	0.35***	0.37***	0.15**
Constant	-5.76*	8.37***	-	-	18.68***	18.53***	10.79***
Size	1.60***	0.91***					0.83***
Market-to-Book	0.00	0.00					0.03***
CapEx	1.56	2.09					3.68
Prop. Plant & Equip.	0.02	0.25					0.05
Profitability	-0.22***	0.63*					0.11
Book Leverage	2.17***	1.73***					2.09***
Firm Age	0.29**	-0.18**					-0.06
R&D	-0.64***	-0.47					3.16**
R&D Indicator	0.07	0.00					0.21
Selling Expense	0.01	-0.22					-1.08*
Foreign Profits	0.43	-0.34**					-0.27
Observations	6,794	1414	837	558	753	753	751
Number of Firms	2,594	604	420	299	382	382	381
Bandwidth			3.61	2.5	3.26	3.26	2.26
Industry FE	Y	Y	N	N	N	Y	Y
Time FE	Y	Y	N	N	N	Y	Y
R-Squared	0.29	0.51	0.04	0.05	0.04	0.11	0.52
1st Stage *Treatment*					0.73***	0.73***	0.75***
Cragg-D F-Statistic					169.3	165.8	163.7

Entity Netted Notionals (ENNs)

S&P 500 Industry Swap Notionals and ENNs: IRS

Fama and French Classification*	Mean Gross Notional	Mean ENNs
Unclassified	12,660.2	14,636.4
Consumer Non-durables	9,777.5	11,637.6
Consumer Durables	538,321.5	129,457.4
Manufacturing	33,629.3	21,531.3
Energy	2,073.2	5,741.2
Chemicals	13,357.3	13,666.7
Business Equipment	19,040.4	13,154.3
Telecommunications	22,034.0	22,321.1
Utilities	11,554.5	15,360.6
Wholesale, Retail, Services	5,455.1	4,179.6
Healthcare	19,188.0	20,469.8
Financials	4,283,298,885.2	261,895,796.4
Other	28,856.6	30,563.3
Total/Sum/Median/Min/Max	19,040.4	15,360.6
Gross Notional		286,987,060,761.3
ENNs		17,550,831,675.7

S&P 500 Industry Swap Notionals and ENNs: FX

Mean Gross Notional	Mean ENNs
4,181.5	2,698.0
5,534.3	3,780.8
13,758.5	9,471.9
7,048.5	4,353.8
1,795.5	812.1
8,155.2	3,923.1
11,663.1	6,912.7
27,220.8	17,999.0
2,188.3	993.6
2,444.4	1,917.2
14,922.9	9,784.0
1,584,219.8	415,023.2
7,094.4	3,566.9
7,094.4	3,923.1
	113,423,277.0
	30,600,368.9

*Note that the Fama and French classification groups SIC codes into 12 industries; unclassified includes those firms for which the SIC was not identified.

**Note that the figures presented do not exclude interafilliates.

***All values are represented in MM US dollar ($) equivalents.

Conclusions

- Larger (+), levered (+), older firms (+), intangible assets (-), and foreign profits (+)
- RDD around discrete credit risk and continuous financial risk thresholds show:
  - (+) financing access => (-) hedging, except those firms that are extremely levered (limited access to external public debt markets)
  - (-) to (+) profits => (-) hedging
  - Marginal effects and significance of determinants are broadly similar to a generic Probit estimation
- Swaps perform an important role for firms managing risk and facing financing constraints
- **Differences between the hedging decision and extent of hedging**
  - **(+) Tangibility (Selling Exp.), (+) Growth Opportunities (MTB/R&D)**

Additional Findings

- Univariate and Descriptive Figures
  - Swap Usage by Index and Product (Appendix)
  - Swap Usage by Industry and Product (Appendix)
  - Swap Usage by S&P Credit Rating (Appendix)
  - Swap Usage by Product and S&P Credit Rating (Appendix)
  - S&P 500 IRS ENNs by Industry (Appendix)
  - S&P 500 FX ENNs by Industry (Appendix)
- Main Findings:
  - Significant swap usage even by smaller firms! (novel)
  - Industry heterogeneity is quite important (novel)
  - Usage differences for rating/index and product type

Industry and Product

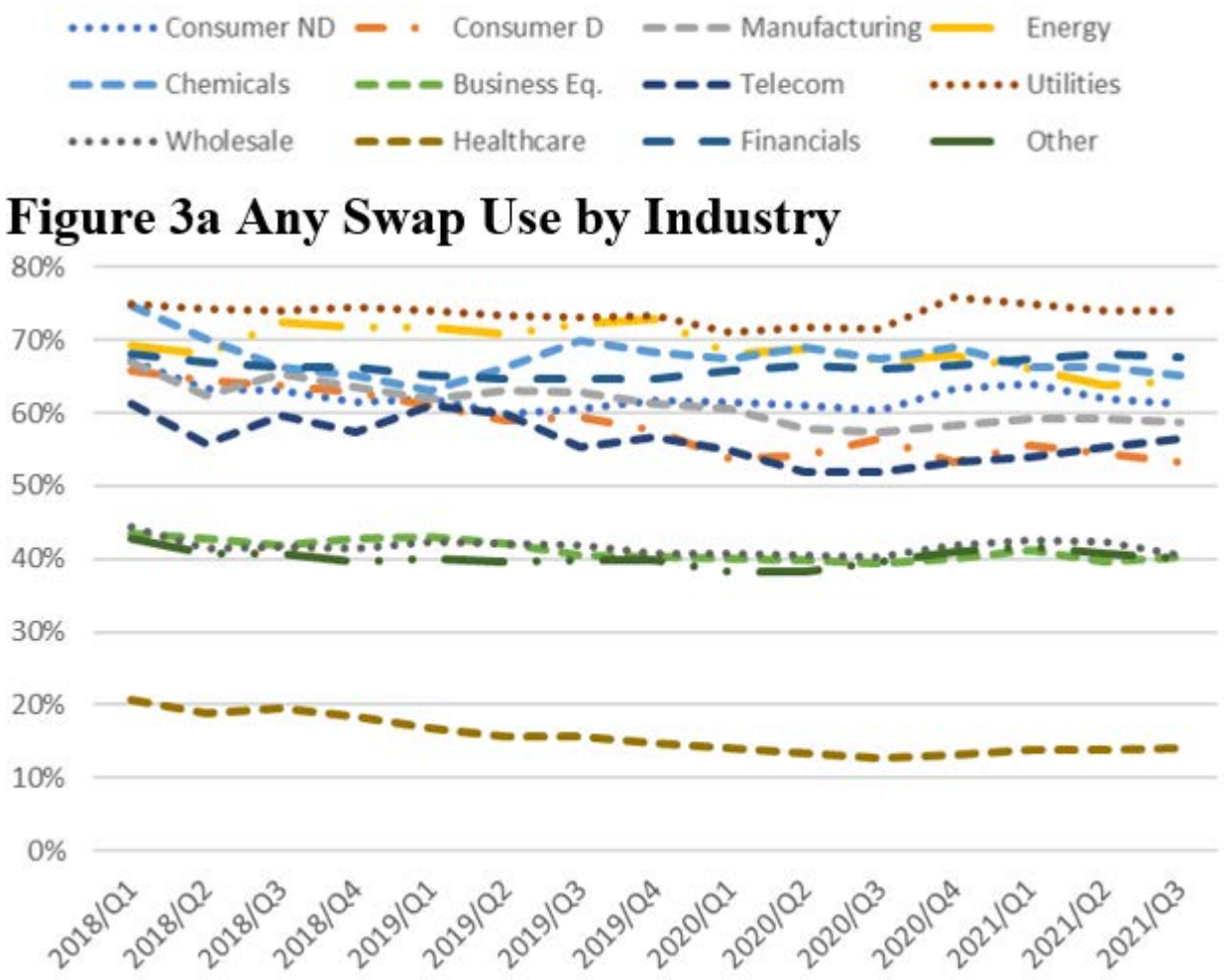

Figure 3a Any Swap Use by Industry

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Q&A

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Appendix - Tables

- Rated vs. Not Rated
- Swap Use Determinants (Expanded Controls)
- RDD: S&P Credit Rating
- RDD: Debt/EBITDA

Rated vs. Not Rated

Variables	(1) **Swap User**	(2) IRS User	(3) FX User	(4) CDS User	(5) COM User	(6) EQ User
Size	1.58***	1.19***	1.69***	2.17**	2.09**	2.55***
	(7.59)	(7.22)	(7.87)	(2.51)	(2.12)	(4.78)
Market-to-Book	-0.02	0.01	-0.02*	0.00	-0.01	0.00
	(-1.50)	(1.16)	(-1.96)	(0.04)	(-0.62)	(0.11)
CapEx	8.17*	-1.40	8.56**	16.11	7.29	15.52
	(1.85)	(-0.37)	(2.30)	(0.77)	(0.80)	(0.27)
Prop. Plant & Equip.	-0.07	-0.50	-3.89***	-2.55	7.66**	-2.01
	(-0.07)	(-0.60)	(-4.59)	(-0.44)	(2.57)	(-0.35)
Profitability	-0.44	-1.24***	-0.55	-0.26	-1.93***	-1.40
	(-1.19)	(-2.92)	(-0.96)	(-0.11)	(-3.03)	(-0.37)
Book Leverage	1.63**	0.89	2.45***	4.27	2.40	3.64
	(2.46)	(1.62)	(3.78)	(0.55)	(0.78)	(0.94)
Firm Age	0.22	-0.01	0.86***	1.86	0.64	1.23
	(1.20)	(-0.06)	(4.45)	(0.95)	(0.89)	(0.55)
R&D	1.65	-7.54**	1.63	1.54	2.96	15.11
	(0.56)	(-2.23)	(0.53)	(0.048)	(0.30)	(1.12)
R&D Indicator	-0.05	0.11	-1.29***	-0.15	0.19	-0.52
	(-0.12)	(0.27)	(-2.88)	(-0.07)	(0.26)	(-0.22)
Selling Expense	-0.51	-1.66	0.09	-4.45	-1.13	-8.54
	(-0.56)	(-1.58)	(0.10)	(-0.15)	(-0.17)	(-1.17)
Foreign Profits	0.84**	0.35	0.88***	-0.53	-0.85	0.03
	(2.50)	(1.33)	(2.91)	(-0.54)	(-1.29)	(0.02)
Observations	2,189	2,229	2,223	2,247	2,181	1,931
Number of Firms	809	823	821	830	805	713
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Pseudo R-Squared	0.20	0.15	0.32	0.24	0.33	0.39

(1) **Swap User**	(2) IRS User	(3) FX User	(4) CDS User	(5) COM User	(6) EQ User
1.66***	1.01***	1.84***	3.73***	1.86**	1.21
(10.66)	(9.93)	(7.45)	(3.17)	(2.49)	(1.32)
-0.01	-0.01	0.01	0.28**	0.01	-0.03
(-0.55)	(-1.23)	(0.90)	(2.48)	(0.11)	(-0.16)
3.76	-0.78	8.46	16.63	3.38	-28.59
(1.52)	(-0.30)	(1.61)	(0.58)	(0.56)	(-0.39)
0.25	0.41	-3.16*	-12.15	3.10	-6.34
(0.36)	(0.60)	(-1.86)	(-1.62)	(0.84)	(-0.52)
-0.26	0.02	-0.55**	7.71	-0.58	4.70
(-1.54)	(0.09)	(-2.43)	(0.95)	(-0.65)	(1.04)
1.50***	1.84***	1.01*	2.56	2.40	-1.73
(3.77)	(4.48)	(1.77)	(0.71)	(1.02)	(-0.49)
0.55***	-0.05	0.78***	2.19*	0.65	-0.58
(4.04)	(-0.43)	(3.09)	(1.72)	(1.03)	(-0.94)
-2.56***	-2.43**	-3.22**	-297.40	-3.53	-33.34
(-3.18)	(-2.02)	(-2.38)	(-1.24)	(-0.44)	(-0.68)
-0.16	-0.29	-1.24**	-3.39	0.95	-2.48
(-0.53)	(-0.95)	(-2.32)	(-0.98)	(1.04)	(-0.93)
-0.47	-2.48***	-1.44**	-0.79	-0.10	5.59
(-1.42)	(-2.68)	(-2.22)	(-0.09)	(-0.04)	(1.31)
0.71***	0.28	0.78**	-1.06	0.29	0.84
(2.82)	(1.04)	(2.21)	(-0.39)	(0.22)	(0.49)
4,657	4,640	4,417	3,154	2,842	841
1,809	1,803	1,717	1,213	1,094	441
Y	Y	Y	Y	Y	Y
Y	Y	Y	Y	Y	Y
0.26	0.18	0.26	0.43	0.37	0.58

Swap Use Determinants - Controls

Variables	(1) **Swap User**	(2) IRS User	(3) FX User	(4) CDS User	(5) COM User	(6) EQ User
Size	1.60***	1.29***	1.69***	2.27***	1.71***	1.76
	(12.34)	(11.19)	(10.37)	(2.89)	(6.05)	(0.56)
Market-to-Book	-0.00	0.01	-0.01	-0.00	-0.00	-0.02
	(-0.57)	(1.48)	(-0.63)	(-0.05)	(-0.23)	(-0.68)
CapEx	5.81**	-0.09	9.49***	11.21	7.01	-7.45
	(2.43)	(-0.04)	(2.80)	(0.25)	(1.63)	(-0.31)
Prop. Plant & Equip.	-0.05	-0.48	-3.80***	-3.43	4.46***	-2.93
	(-0.08)	(-0.81)	(-4.58)	(-0.54)	(3.34)	(-0.61)
Profitability	-0.18	-0.26	-0.56***	-0.23	-0.27	4.01
	(-1.05)	(-1.45)	(-2.90)	(-0.05)	(-0.82)	(0.47)
Book Leverage	1.91***	2.07***	1.70***	5.71	1.93**	0.37
	(5.52)	(5.86)	(4.36)	(0.90)	(2.55)	(0.10)
Firm Age	0.33***	0.10	0.66***	2.31	0.50**	1.22
	(2.62)	(0.77)	(4.05)	(0.15)	(2.11)	(0.45)
R&D	-2.52***	-3.75***	-3.35***	-5.43	-3.52	5.56
	(-2.88)	(-2.58)	(-3.65)	(-0.10)	(-1.11)	(0.33)
R&D Indicator	-0.26	-0.20	-1.47***	0.30	0.37	-1.80
	(-1.01)	(-0.77)	(-4.26)	(0.08)	(0.86)	(-0.99)
Selling Expense	-0.51	-3.15***	-1.18**	-2.46	0.16	0.98
	(-1.08)	(-5.39)	(-2.56)	(-0.13)	(0.35)	(0.22)
Foreign Profits	0.86***	0.48**	0.97***	-0.17	-0.34	-0.69
	(4.13)	(2.46)	(4.24)	(-0.05)	(-0.94)	(-0.36)
S&P Index Indicator	0.37*	-0.59***	0.97***	-0.87	-0.20	-1.24
	(1.83)	(-2.68)	(3.86)	(-0.21)	(-0.45)	(-0.41)
HHI	-0.28	0.72	-0.81	-0.14	-1.45	-0.82
	(-0.58)	(1.58)	(-1.35)	(-0.03)	(-1.35)	(-0.48)
Dividend Payer	0.17	-0.04	0.23	2.65	0.40	3.20
	(0.80)	(-0.17)	(0.91)	(0.14)	(1.05)	(0.49)
Altman Z-Score	-0.03	-0.05*	-0.03	0.22	-0.19**	-0.29
	(-1.58)	(-1.79)	(-1.07)	(0.65)	(-2.42)	(-0.91)
OCF Volatility	0.00	-0.00	0.00	-0.00	0.00*	0.00
	(0.47)	(-1.10)	(1.57)	(-0.05)	(1.77)	(1.07)
Observations	5,975	5,984	5,969	5,984	5,786	5,467
Number of Firms	2,283	2,286	2,280	2,286	2,214	2,088
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Pseudo R-Squared	0.33	0.23	0.34	0.37	0.39	0.45

Sharp RD: S&P Rating

	Panel A: C_1 >=B+				Panel B: C_2 >= BBB			
	(2) Sharp xtprobit	(4) Sharp xtprobit	(5) Sharp xtprobit	(7) Sharp xtprobit	(2) Sharp xtprobit	(4) Sharp xtprobit	(5) Sharp xtprobit	(7) Sharp xtprobit
Treatment	-1.06**	-1.01**	-0.55	-0.30	-0.51*	-0.95*	-0.94**	-1.26***
DTC	0.84***	0.53***	0.56***	0.16	0.45***	-0.01	0.64***	0.08
Constant	2.51***	-8.73***	2.44***	-10.99***	5.02***	-11.35***	4.83	-11.22***
Size		1.28***		1.61***		1.60***		1.55***
Market-to-Book		-0.01		-0.02		-0.02		-0.02
CapEx		7.67		5.42		8.81*		11.65**
Prop. Plant & Equip.		0.21		-0.06		-2.10*		-1.55
Profitability		-0.21		-0.63		-1.25		-0.56
Book Leverage		1.90**		1.79**		2.77***		2.35***
Firm Age		0.06		0.16		0.49**		0.44**
R&D		-2.38		0.45		4.51		6.25*
R&D indicator		-0.17		-0.25		-0.23		-0.04
Selling Expense		-0.21		-1.28		-1.74		-0.54
Foreign profits		0.78*		0.89**		0.37		0.53
Observations	1,083	1,018	1,855	1,790	1,610	1,496	1,854	1,752
Number of Firms	450	424	704	680	617	574	707	669
Bandwidth	2	2	5	5	4	4	6	6
Industry FE	N	Y	N	Y	N	Y	N	Y
Time FE	N	Y	N	Y	N	Y	N	Y
Pseudo R2	0.02	0.19	0.04	0.19	0.02	0.18	0.04	0.21

High Credit Risk

Low Credit Risk

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Fuzzy RD: Debt/EBITDA

	Panel A: C_1 >=0			Panel B: C_2 >=5.7		
	(4)	(5)	(6)	(4)	(5)	(6)
	Fuzzy IV ivprobit	Fuzzy IV ivprobit	Fuzzy IV ivprobit	Fuzzy IV ivprobit	Fuzzy IV ivprobit	Fuzzy IV ivprobit
Treatment	-0.96*	-0.97*	-1.34*	-0.95**	-0.47**	-1.38*
DTC	0.28	0.59**	0.69**	-0.02	0.12	0.05
Constant	0.03	0.24	-2.50	0.48**	0.77	-1.24
Size			0.33**			0.36**
Market-to-Book			0.01			-0.01*
CapEx			0.79			0.80
Prop. Plant & Equip.			-0.03			0.18
Profitability			-0.06			0.01
Book Leverage			0.63***			0.47*
Firm Age			0.15*			0.03
R&D			-0.79*			-0.56
R&D indicator			0.20			-0.09
Selling Expense			0.02			-0.15
Foreign profits			0.68*			0.43*
Observations	1301	1,301	1,164	1,460	1,436	1,334
Number of firms	903	903	810	962	947	871
Bandwidth	0.5	0.5	0.5	2	2	2
Baseline Controls	N	Y	Y	N	N	Y
Industry FE	N	Y	Y	N	Y	Y
Time FE	0.01	0.06	0.21	N	Y	Y
Pseudo R-Squared	0.19***	0.20***	0.13**	0.00	0.10	0.19
1st Stage *Treatment*	12.8	12.9	12.0	0.25***	0.64***	0.11**
Cragg-D F-Statistic				21.9	208.3	19.0

Moderate Financial Risk

Extreme Financial Risk

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Appendix - Figures

- Swap Usage by Index and Product
- Swap Usage by Industry and Product
- Swap Usage by S&P Credit Rating
- Swap Usage by Product and S&P Credit Rating
- IRS ENNs by Industry (S&P 500)
- FX ENNs by Industry (S&P 500)

Index and Product

Figure 2a S&P 500 Swap Use by Product

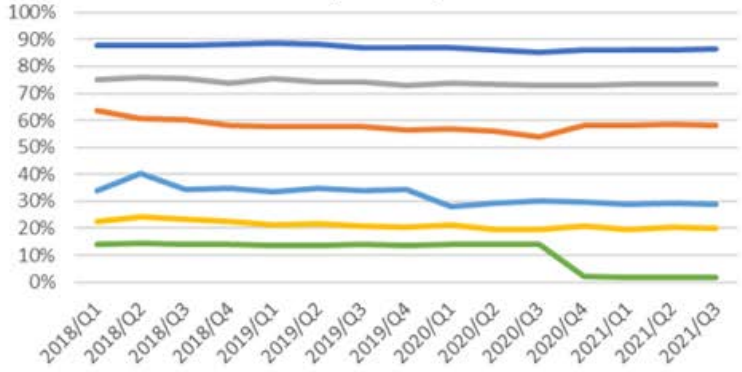


Figure 2b S&P 400 Swap Use by Product

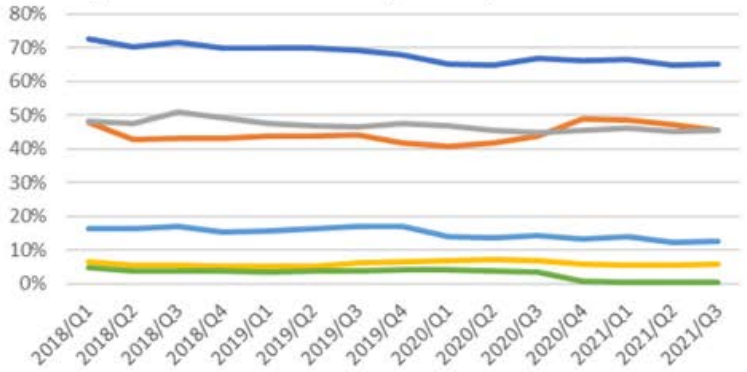


Figure 2c S&P 600 Swap Use by Product

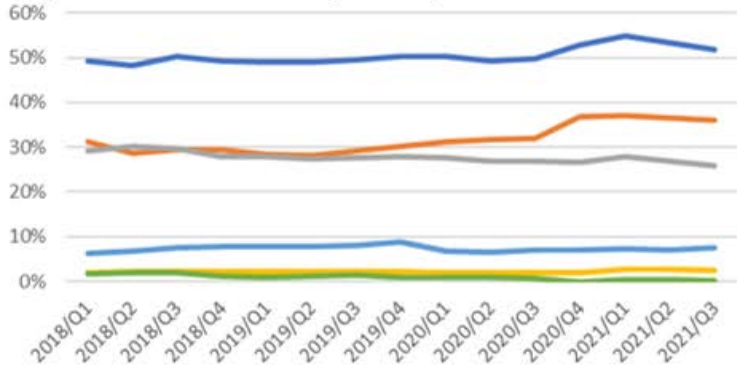
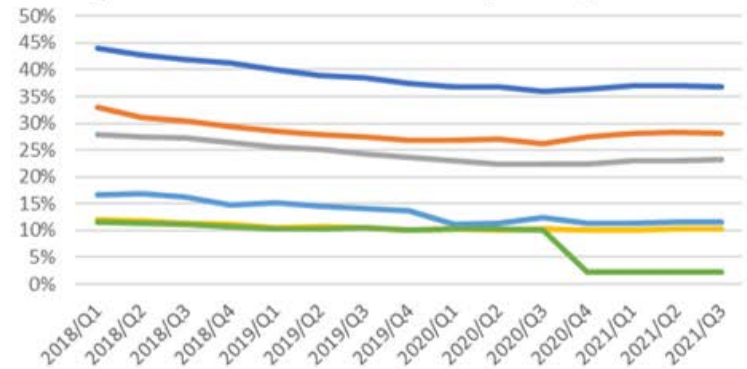


Figure 2d Non-S&P Index Swap Use by Product



Industry and Product

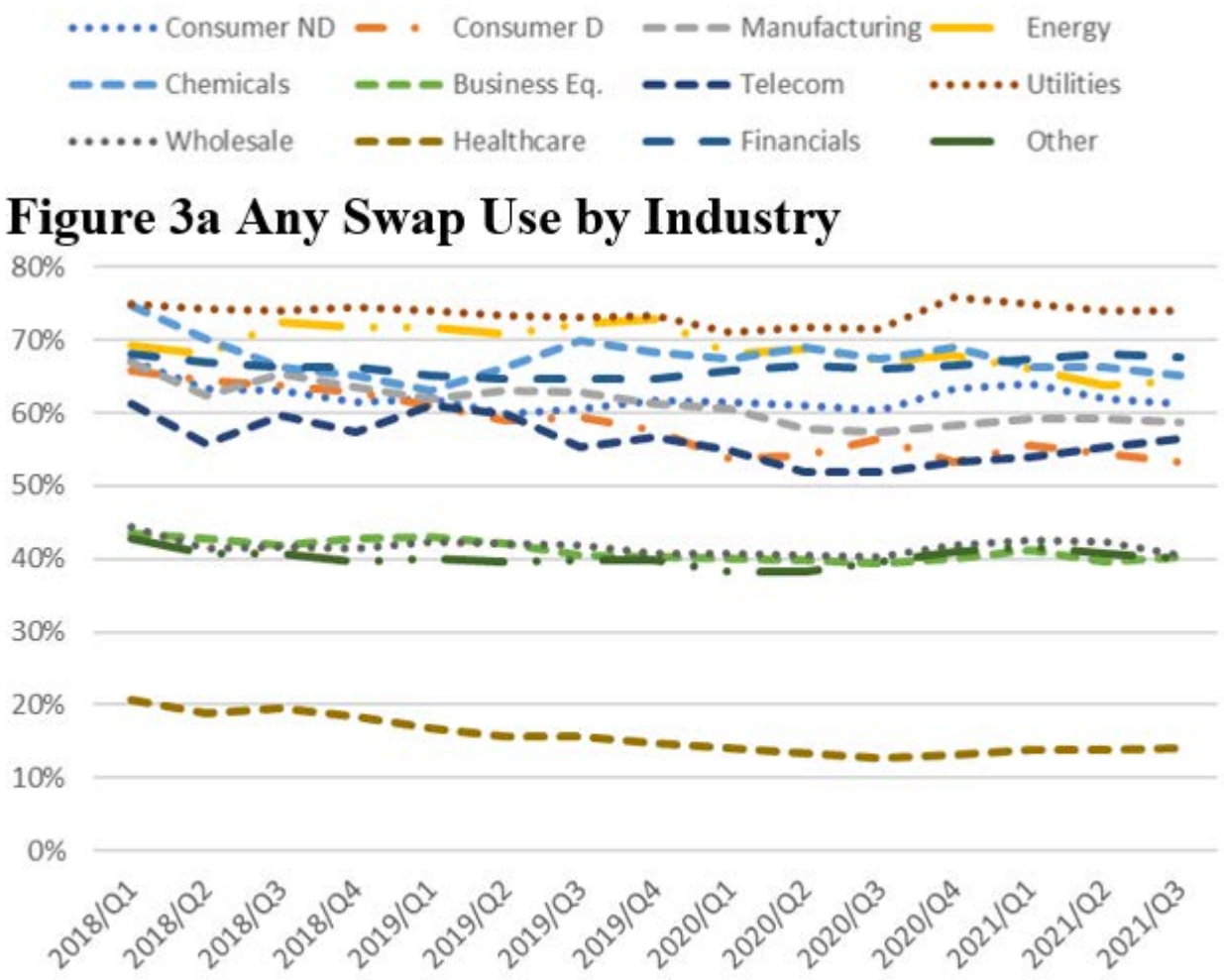


Figure 3a Any Swap Use by Industry

Industry and Product

Figure 3b IRS Use by Industry

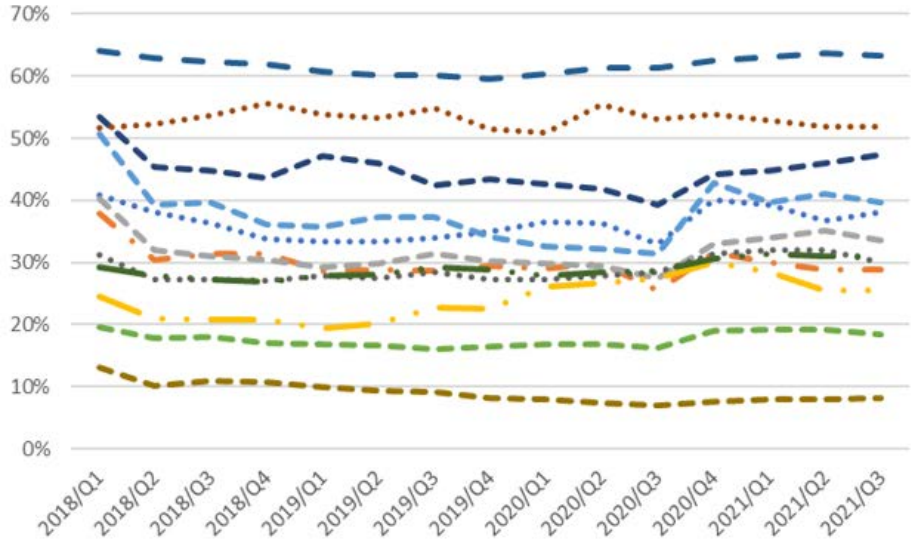


Figure 3c FX Use by Industry

Industry and Product

Figure 3e COM Use by Industry

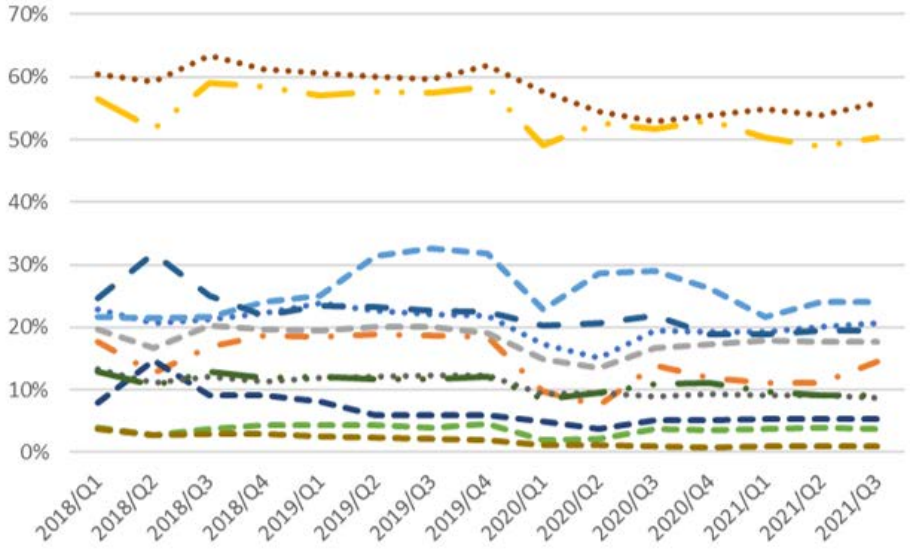
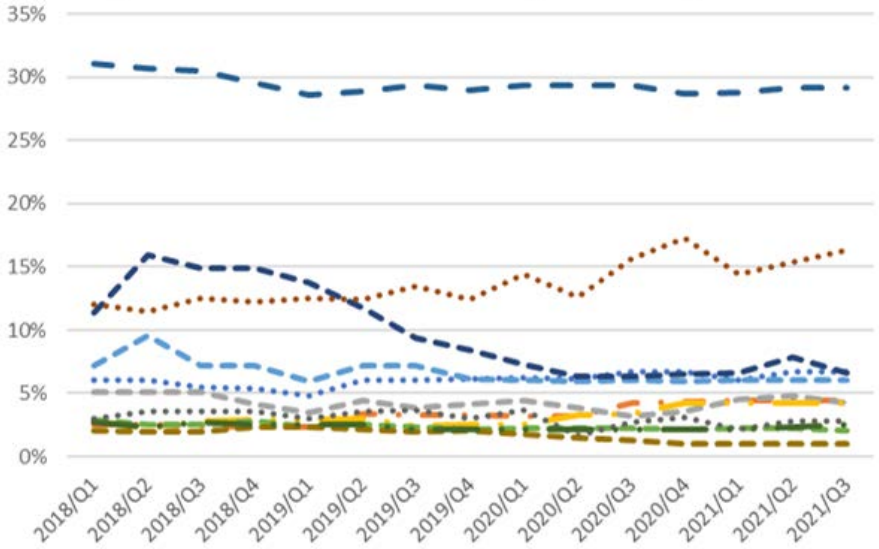


Figure 3d CDS/CDX Use by Industry



Swap Use and Rating

Figure 4a Any Swap Use by Rating

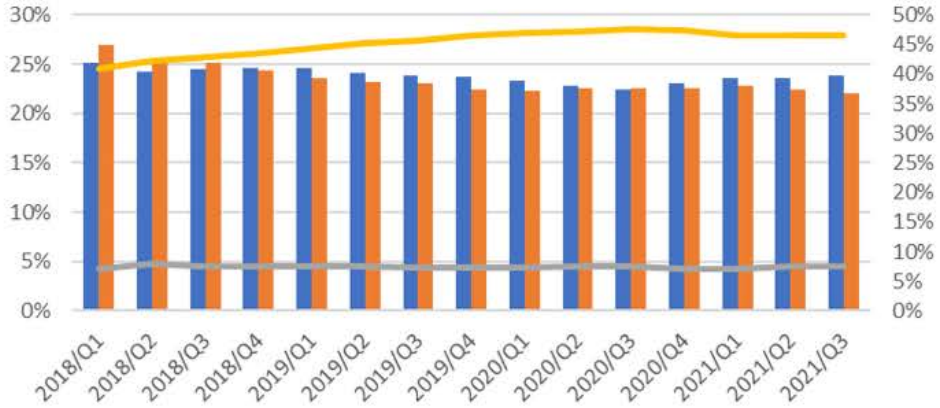


Figure 4b IRS Use by Rating

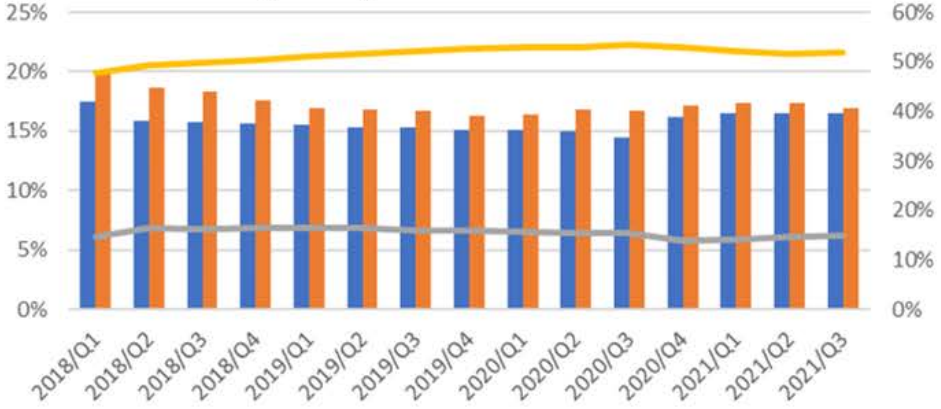


Figure 4c FX Use by Rating

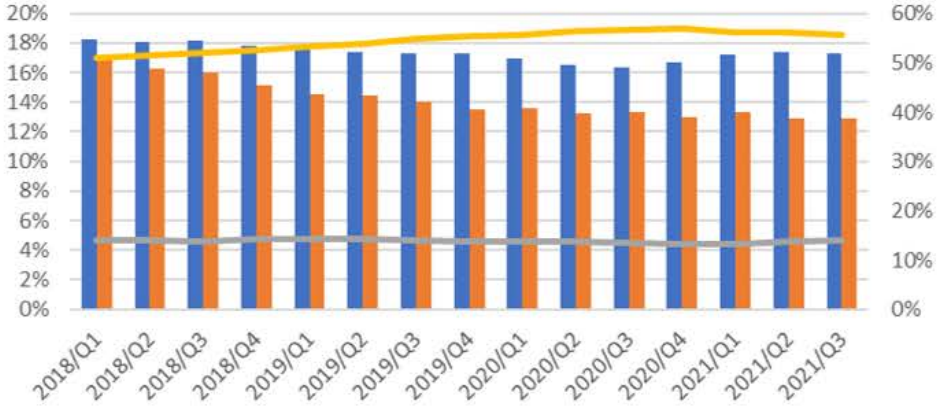
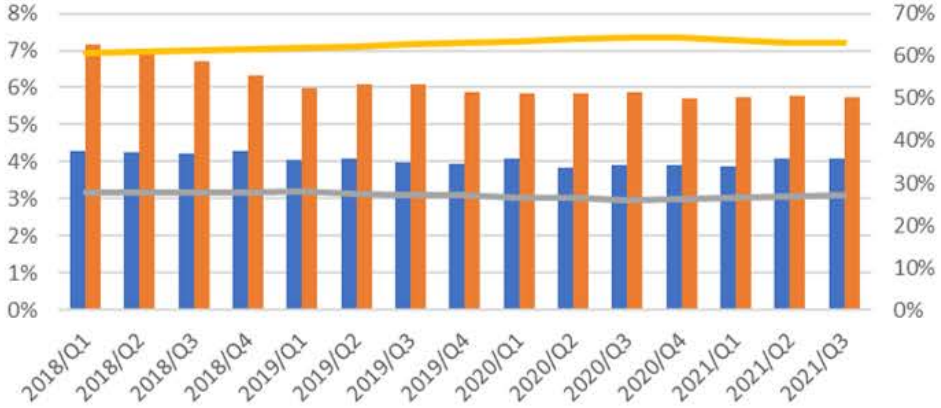


Figure 4d CDS/CDX Use by Rating



Swap Use and Index

Figure 5a S&P 500 Swap Use by Product/Rating

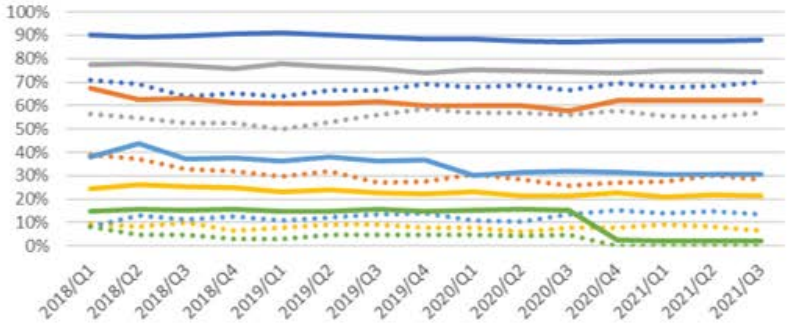


Figure 5b S&P 400 Swap Use by Product/Rating

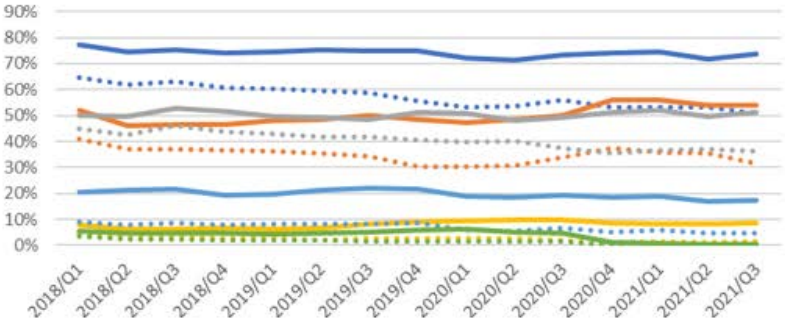
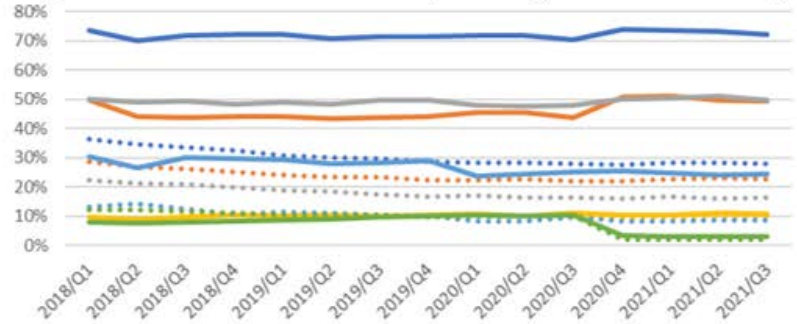


Figure 5c S&P 600 Swap Use by Product/Rating

Figure 5d Non-SP Index Swap Use by Product/Rating



IRS ENNs

Figure 2. S&P 500 Industry Swap Notionals and ENNs: IRS

IRS

Fama and French Classification*	Gross Notional	Mean Gross Notional	ENNs	Mean ENNs
Unclassified		12,660.2		14,636.4
Consumer Non-durables		9,777.5		11,637.6
Consumer Durables		538,321.5		129,457.4
Manufacturing		33,629.3		21,531.3
Energy		2,073.2		5,741.2
Chemicals		13,357.3		13,666.7
Business Equipment		19,040.4		13,154.3
Telecommunications		22,034.0		22,321.1
Utilities		11,554.5		15,360.6
Wholesale, Retail, Services		5,455.1		4,179.6
Healthcare		19,188.0		20,469.8
Financials		4,283,298,885.2		261,895,796.4
Other		28,856.6		30,563.3
Total/Sum/Median/Min/Max	286,987,060,761.3	19,040.4	17,550,831,675.7	15,360.6

*Note that the Fama and French classification groups SIC codes into 12 industries; unclassified includes those firms for which the SIC was not identified.

**Note that the figures presented do not exclude interafilliates.

***All values are represented in MM US dollar ($) equivalents.

FX ENNs

Figure 3. S&P 500 Industry Swap Notionals and ENNs: FX

FX

Fama and French Classification*	Gross Notional	Mean Gross Notional	ENNs	Mean ENNs
Unclassified		4,181.5		2,698.0
Consumer Non-durables		5,534.3		3,780.8
Consumer Durables		13,758.5		9,471.9
Manufacturing		7,048.5		4,353.8
Energy		1,795.5		812.1
Chemicals		8,155.2		3,923.1
Business Equipment		11,663.1		6,912.7
Telecommunications		27,220.8		17,999.0
Utilities		2,188.3		993.6
Wholesale, Retail, Services		2,444.4		1,917.2
Healthcare		14,922.9		9,784.0
Financials		1,584,219.8		415,023.2
Other		7,094.4		3,566.9
Total/Sum/Median/Min/Max	113,423,277.0	7,094.4	30,600,368.9	3,923.1

*Note that the Fama and French classification groups SIC codes into 12 industries; unclassified includes those firms for which the SIC was not identified.

**Note that the figures presented do not exclude interafilliates.

***All values are represented in MM US dollar ($) equivalents.

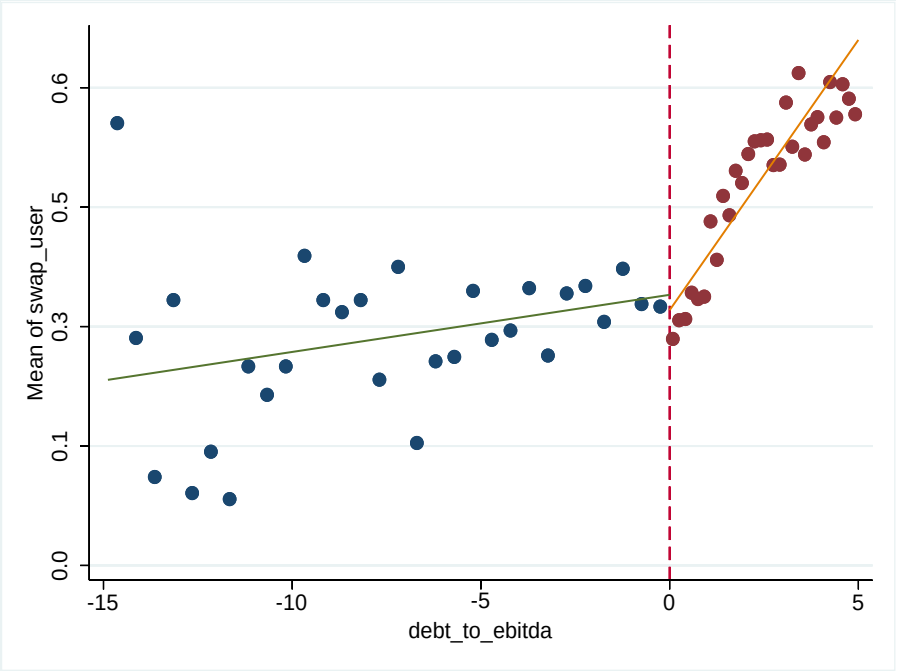
Appendix – RDD Implementation

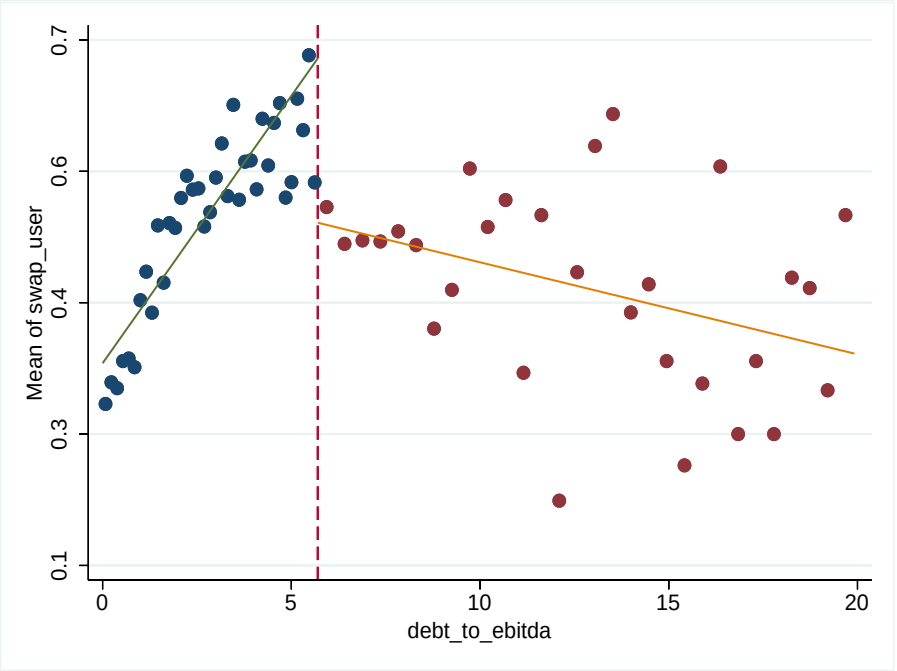
- RDD & Endogeneity
- Rating & Debt-to-EBITDA Group/Ventile Plots
- Debt-to-EBITDA Binning Plot
- McCrary (2008) Plots
- McCrary (2008) Test Statistics

RDD & Endogeneity

- Endogeneity
  - Omitted variables, simultaneity, measurement error
- IV, DD, RDD … which one?
  - Superiority of an RDD design in that it has more limited assumptions
    - **IV assumes exogeneity of the instrument; RD does not assume this, rather it is a consequence of imprecision**
    - See Lee (2008), Lee and Lemieux (2010) and Hahn et al. (2001)]
- Comparable internal validity to randomized control trials (RCTs), i.e. the "gold standard"
  - **RD is comparable to a truly random experiment (internally)**

Binning Plot (N = 30)





McCrary (2008) Test Statistics

	S&P Rating C_1 >= B+	S&P Rating C_2 >= BBB	Debt/EBITDA C_1 >= 0	Debt/EBITDA C2 >= 5.7
Robust T-Statistic	-1.49	2.94	1.60	1.18
P-Value	0.14	0.00***	0.11	0.24
Model	Unrestricted	Unrestricted	Unrestricted	Unrestricted
Bandwidth Method	MSE	MSE	MSE	MSE
Kernel	Triangular	Triangular	Triangular	Triangular
VCE Method	Jackknife	Jackknife	Jackknife	Jackknife

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