Index Creation, Information, and External Finance

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Information Frictions and External Financing

- Evaluating and monitoring informationally opaque firms is both costly and imperfect.

- Information frictions determine whether firms
  - finance internally or externally
  - seek funds from private financiers or public investors in arm's length capital market transactions.

- Question: How do firms respond to exogenous shocks to information frictions?
  - What securities do they issue? Debt or equity? Type of debt?
  - How does leverage change?

Theoretical Predictions

- Adverse selection models: firms rely more on internal funds and less on risky debt and outside equity when information asymmetries are significant.
- Firms have lower leverage than is otherwise optimal.
- As the information environment improves, monitoring and screening costs decline.
  - Supply of external financing increases.
  - Firms switch from internal funds (and safe debt) to risky debt.
  - They issue equity only when financing with debt would produce excessive leverage.
  - Better information production should be more relevant for public debt investors.

THIS PAPER

- Sample of **exogenous** additions of stocks to equity indexes (e.g., new index creation)
- These shocks are important for a firm's information production.
  - Funds benchmark to these indexes. Institutional ownership increases.
  - Institutions specialize in monitoring and evaluating firms - this increases the amount of information produced on indexed firms.
  - Institutions value public information. Hence, demand for analysts' services increases.
- Preview of results
  - Debt and leverage increase as information frictions disappear.
  - This is mostly because firms issue more information-sensitive public debt (e.g., bonds).

Contribution

- Joint evidence on the effects of index inclusion on bond and stock liquidity, analyst coverage, media coverage, and the costs of debt and equity financing is new.

- Effects of information and other supply-side frictions on the financing of firms (Faulkender and Petersen, 2006; Leary, 2009; Sufi, 2009; Rice and Strahan, 2010; Saretto and Tookes, 2013)

- Effects of index membership (Boone and White, 2015; Appel et al., 2016; Bird and Karolyi, 2016; Crane et al., 2016; Schmidt and Fahlenbrach, 2017; Cao et al., 2019).

Identification of Index Events

- Screening of ∼54,000 press releases from 32 index providers from 1996 to 2014.
- Exclude indexes that only cover financial firms or tailored to a specific client with no further information available.
- **Event types**:
  - **Launch of New Indexes (or Closures of Indexes):** Formation of new equity indexes
  - **Universe Change:** Changes to the countries or industries eligible for index inclusion
  - **Number Change:** Increases in the number of index constituents
  - **Ranking Methodology Change:** Changes in index selection criteria or changes in criteria weightings

Event Types

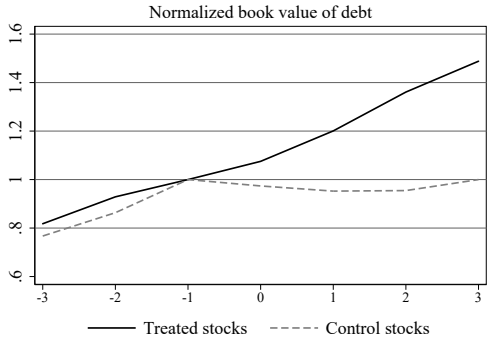
	(1)	(2)	(3)	(4)
Type (# of events)	Raw data	Unique firms	Available Worldscope data	
			DID sample	RDD sample
Launch (155)	7,534	4,832	3,639	1,444
Index universe change (19)	132	122	69	30
Number change (10)	452	452	282	197
Ranking methodology change (14)	31	31	26	0
Total (198)	**8,149**	**5,290**	**3,913**	**1,660**

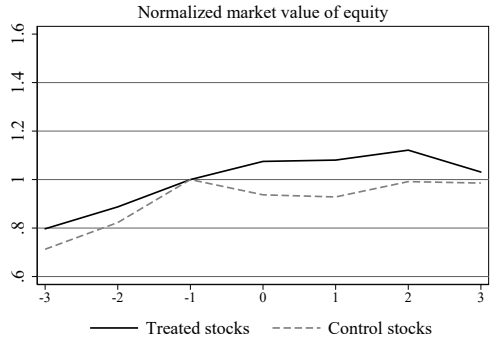
- Approach allows for the usage of recent data (no endogenous float adjustments).
- Announcements are on short notice (∼44 days between index announcement and index start date).
- 3.26 ETFs benchmark against the sample indexes (Morningstar: 4.51).

Analysis

- **DID**
  - Treatment group: 3,913 stocks exogenously added to an index
  - Control group: nearest neighbor stocks in the same country, industry and in the same year, additionally matched on size, profitability, tangibility, and the market-to-book ratio
  - Balancing works reasonably well.
- **RDD**
  - Sample: Only index events with available index methodology (1,660 treatment stocks)
  - Control group: Based on the index methodology, we identify control firms from the eligible firm universe that have not been included in the index.
- **Trade-off**: sample size vs. randomization of treatment

Evolution of Debt and Equity





- Debt increases, equity remains constant
- No obvious violation of the parallel trends assumption

Stocks Added to an Index: Difference-in-Differences

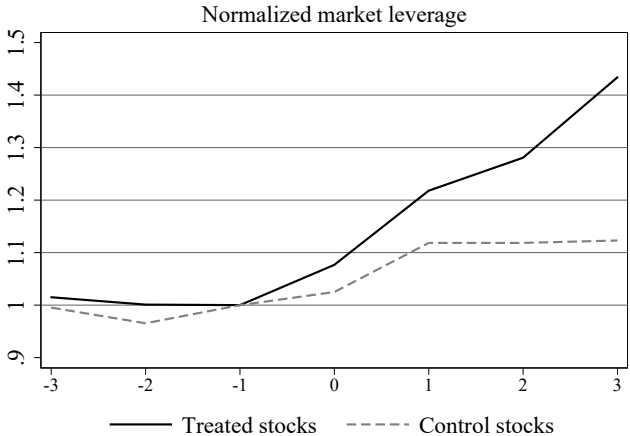
$$\begin{aligned}\text{Financial Policy}_{i,j,k,t} = \alpha \cdot \text{Treated}_i \cdot \text{Post}_t + \beta \cdot \text{Post}_t + \vec{\gamma} \cdot \vec{X}_{i,j,k,t-1} \\ + \delta_1 \cdot I_i + \delta_2 \cdot I_t \cdot I_j + \delta_3 \cdot I_t \cdot I_k + \epsilon_{i,j,k,t},\end{aligned} \tag{1}$$

- $\vec{X}$ includes:
  - Firm size
  - Profitability
  - Tangibility
  - Market-to-book ratio
- I_i: Firm fixed effects
- $I_t \cdot I_j$: Industry-year fixed effects
- $I_t \cdot I_k$: Country-year fixed effects

Debt and Equity Issuances

Model	1	2	3	4	5	6
Window (years)	[-1,1]	[-2,2]	[-3,3]	[-1,1]	[-2,2]	[-3,3]
Dep. variable	DEBT ISSUANCE			EQUITY ISSUANCE		
Treated x Post	**0.018*** **	**0.015*** **	**0.012** **	**-0.004**	**-0.006***	**0.001**
	(0.006)	**(0.006)**	**(0.005)**	**(0.003)**	**(0.003)**	**(0.005)**
Post	-0.010	-0.006	-0.011**	0.001	-0.000	-0.004
	(0.007)	(0.005)	(0.005)	(0.003)	(0.002)	(0.003)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year × Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18,734	31,527	42,013	18,478	31,178	41,646
Treated	9,974	17,046	24,171	9,864	16,854	23,891
Adjusted R^2	0.510	0.424	0.361	0.621	0.435	0.193

Normalized Market Leverage



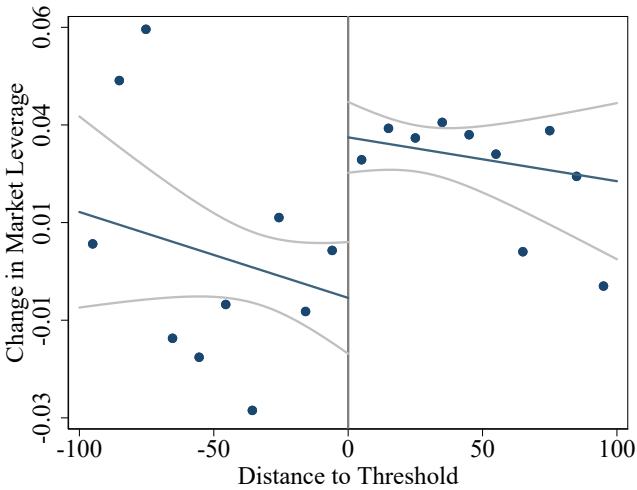
- Leverage increases
- No apparent violation of parallel trends assumption

Market Leverage: Difference-in-Differences

Model	1	2	3	4
Window (years)	[-1,1]	[-2,2]	[-3,3]	[-3,3]
Dep. variable	MARKET LEVERAGE			BOOK LEVERAGE
Treated x Post	**0.011****	**0.015*****	**0.017*****	**0.019*****
	(0.004)	**(0.005)**	**(0.006)**	**(0.005)**
Post	-0.003	-0.005	-0.010**	-0.010**
	(0.004)	(0.004)	(0.005)	(0.005)
Firm controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes
Observations	22,460	38,433	51,439	51,439
Treated	11,816	20,587	29,277	29,277
Adjusted R^2	0.910	0.881	0.843	0.837

▸ Robustness

Regression Discontinuity Design



- Leverage increases by about 3% for firms added to an index.
- Density decreases the farther one goes away from the inclusion threshold.
- Covariates are well balanced.

ΔMarket Leverage: RDD

Model	1	2	3	4	5	6	7	8
Window (years)	1 vs. -1	2 vs. -1	3 vs. -1	3 vs. -1	3 vs. -1	3 vs. -1	3 vs. -1	3 vs. -1
Treated	**0.012****	**0.022*****	**0.028*****	**0.030*****	**0.025***	**0.035*****	**0.021**	**0.027**
	(0.006)	**(0.007)**	**(0.008)**	**(0.010)**	**(0.015)**	**(0.012)**	**(0.014)**	**(0.017)**
ΔFirm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,340	3,806	3,615	3,615	3,615	2,147	1,439	1,009
Treated	2,511	2,210	2,109	2,109	2,109	1,364	922	635
Distance to threshold	22	21	21	21	21	14	10	7
Adjusted R^2	0.346	0.401	0.361	0.361	0.360	0.381	0.420	0.445
Polynominal	One	One	One	Two	Four	One	One	One
Bandwidth	All	All	All	All	All	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$

- Subsample analysis: Effects not driven by strategic behavior of index providers.

Why Does Leverage Change?

- Does the information environment improve?
  - Analyst and news coverage
  - Stock liquidity (average daily relative bid-ask spreads)
- Public debt is relatively more information-sensitive. Do firms increase public debt relative to bank debt?
- Changes in price and liquidity of debt
  - Does the cost of debt decline? How about the cost of equity?
  - Does bond liquidity improve?
    - Identify more than 24,000 bonds. Construct four different measures of bond liquidity.
- International variation: Do disclosure standards and accounting quality matter?

Information production $[-3, 3]$

Unit of observation	Firm			Bond	
Dep. variable	ANALYST	NEWS COVERAGE	LIQUIDITY COSTS	ROLL_ZERO	ZERO_RET
Treated x Post	**0.141*****	**0.160*****	**-0.051****	**-0.046****	**-0.042****
	(0.019)	**(0.050)**	**(0.022)**	**(0.019)**	**(0.019)**
Post	-0.004	-0.185***	0.050***	0.033	<0.000
	(-0.011)	(0.040)	(-0.015)	(0.042)	(0.044)
Control Variables	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	No	No
Bond FE	No	No	No	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	29,000	22,836	42,338	31,590	52,861
Adjusted R^2	0.849	0.890	0.95	0.927	0.954

Debt Structure

Model	1	2	3	4	5	6
Window (years)	[-1,1]	[-2,2]	[-3,3]	[-1,1]	[-2,2]	[-3,3]
Dep. variable	PUBLIC DEBT RATIO			PRIVATE DEBT RATIO		
Treated x Post	**0.017*****	**0.014*****	**0.011****	**-0.003**	**0.003**	**0.001**
	(0.005)	**(0.005)**	**(0.005)**	**(0.006)**	**(0.006)**	**(0.007)**
Post	-0.009***	-0.011***	-0.008**	-0.000	0.002	-0.001
	(0.003)	(0.003)	(0.004)	(0.005)	(0.005)	(0.005)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21,319	39,208	56,412	21,319	39,208	56,412
Treated	13,698	25,444	37,659	13,698	25,444	37,659
Adjusted R^2	0.809	0.760	0.740	0.861	0.825	0.790

Index Membership and Cost of Financing

Model	1	2	3
Window (years)		[-3,3]	
Dep. variable	OFFERING YIELD	OFFERING YIELD (weighted)	MED_ICC
Treated x Post	**-0.171*** **	**-0.173*** **	**-0.120**
	(0.066)	**(0.065)**	**(0.252)**
Post	0.111*	0.109*	0.023
	(0.057)	(-0.062)	(0.190)
Control variables	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes
Observations	4,237	4,237	17,297
Adjusted R^2	0.414	0.399	0.589

International Variation

	Disclosure Standards		Accounting Quality	
	Low	High	Low	High
Treated x Post	**0.027*****	**0.004**	**0.021****	**0.003**
	(0.009)	**(0.009)**	**(0.009)**	**(0.007)**
Post	-0.015**	0.018**	-0.015*	0.011*
	(0.007)	(0.009)	(0.008)	(0.007)
Firm controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes
Observations	27,739	8,679	16,344	13,278

Conclusions

- Leverage increases when a firm is added to an index.
- Effects are largely due to the issuance of more public debt.
- Information asymmetries decline.
  - # of analysts & # of news increase.
  - Stock liquidity improves.
  - Cost of debt declines. Cost of equity does not change.
  - Bond liquidity improves.
- Effect is larger in countries with weak disclosure and accounting standards.
- Index membership reduces adverse selection and increases the supply of public debt.

Appendix

Distribution Across Markets

Australia (5)	44	32	20	0
Canada (3)	82	68	51	0
China (35)	1,633	852	734	549
France (9)	543	375	282	231
Germany (19)	439	347	269	11
Greece (24)	448	208	154	90
Hong Kong (28)	1,060	369	269	117
India (8)	211	140	93	73
Israel (9)	174	125	74	47
Japan (5)	590	466	378	0
Netherlands (7)	55	51	32	12
Poland (7)	229	224	154	138
Portugal (3)	20	14	5	7
Singapore (11)	393	281	192	23
South Korea (5)	131	116	97	19
Spain (5)	122	92	57	47
Sweden (5)	87	57	39	9
Switzerland (6)	94	48	33	19
Taiwan (4)	120	116	90	77
United Kingdom (28)	633	419	277	109
United States (26)	1,041	890	613	82
Total (198)	**8,149**	**5,290**	**3,913**	**1,660**

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DID Robustness

Model	1	2	3	4	5
Window (years)	[-3,3]	[-3,3]	[-8,-6]	[-9,-5]	[-10,-4]
Test	Not part of important index	Strict caliper	Placebo	Placebo	Placebo
Dep. variable	MARKET LEVERAGE				
Treated x Post	**0.020****	**0.014****	**-0.021***	**-0.014**	**-0.014**
	(0.008)	**(0.006)**	**(0.011)**	**(0.011)**	**(0.013)**
Post	-0.006	-0.003	0.020***	-0.012	0.001
	(0.004)	(0.005)	(0.008)	(0.008)	(0.010)
Control variables	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year x Country FE	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	38,621	29,538	6,162	8,699	9,911
Adjusted R^2	0.872	0.836	0.91	0.888	0.864

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Propensity score matching with caliper specification

Variable	Before matching				After matching			
	Mean (treated)	Mean (un-matched)	Dif.	Norm. dif.	Mean (treated)	Mean (matched)	Dif.	Norm. dif.
Ln(Total assets)	13.24	11.71	1.54	0.23	13.24	13.28	-0.04	-0.01
Profitability	0.11	0.02	0.09	1.12	0.11	0.11	0.00	-0.01
Tangibility	0.30	0.29	0.01	0.10	0.30	0.29	0.01	0.11
Market-to-book ratio	3.30	3.20	0.11	0.00	3.30	3.50	-0.20	0.00
Firms	2,698	30,996			2,698	1,444		

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DID: Country-industry-year fixed effects

Model	1	2	3	4
Window (years)	[-1,1]	[-2,2]	[-3,-3]	[-3,-3]
Dep. variable	MARKET LEVERAGE			BOOK LEVERAGE
Treated x Post	**0.012*** **	**0.013*** **	**0.009**	**0.012** **
	(0.004)	**(0.005)**	**(0.006)**	**(0.005)**
Post	-0.004	-0.005	-0.002	-0.001
	(0.004)	(0.003)	(0.004)	(0.004)
Control variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year x Country x Industry FE	Yes	Yes	Yes	Yes
Observations	22,132	37,682	52,450	52,450
Adjusted R^2	0.922	0.908	0.874	0.876

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