New Products

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New Products

- Challenging to measure innovation in a systematic way
- R&D expenditures quantify innovation inputs and patents capture intermediate innovation output
  - More difficult to value final innovation output
  - Yes, scanner data in the retail sector or FDA data for pharmaceuticals
  - Any way to capture aggregate new product creation and have cross-industry comparisons?
- We propose a method to value product innovation based on machine learning on news articles combined with the stock price data

Our Approach

- Covers all industries in a systematic way, including new economy firms
- Forward-looking: (Rational and efficient) financial markets value the expected profitability of new products or services
- Our earlier work (Mukherjee, Singh, and Žaldokas (2017)) uses a bag of words approach and shows that state corporate taxes reduce new product introductions

Plan

- Measure and general trends
- Innovation process
- Stylized facts
  - Competitive environment
  - Productivity

Methodology and General Trends

Methodology

- Extract all media articles from the Dow Jones Factiva database that involve firms listed on the US stock exchanges
- Focus on articles that Factiva has filed under New Products/Services category over 1989-2015
  - Starting sample: 660,958 articles
  - After filtering out the days with major events and restricting the firm to be mentioned within the first 50 words or title: 326,398 articles / 16,278 distinct firms
  - However, these articles might include references to earlier product launches, minor updates, repeated presentations at a trade show, etc.
- Apply convolutional neural network (machine-learning)

Methodology

- Build training sample by asking 31 undergraduate students to classify 2,000 articles each in a binary fashion:
  - Indicate whether the article discusses a major new product introduction
- Only keep the articles where both students agree on their classifications (76% of cases)
  - Training sample: 15,160 labeled articles
- Classify remaining articles using Google's pre-trained word2vec word embeddings
  - The final k-fold out-of-sample results' precision (ratio of true positives) of 93%
  - A recall (ratio of positive articles found) of 86%
- Still we might have some noise

New Product

NVIDIA unveils GoForce 5500 handheld GPU

210 words
14 February 2006
Telecomworldwire
TLCW
English

The NVIDIA GoForce 5500 handheld graphics processing unit (GPU) has been unveiled by NVIDIA Corporation (**Nasdaq**:NVDA), a programmable graphics processor technologies company.

According to NVIDIA the GoForce 5500 is the industry's first handheld GPU to enable true, fluid digital TV, rapid multi-shot photography, high-fidelity surround sound and console-class 3D graphics.

NVIDIA said its GoForce 5500 offers ultra-low power consumption and is the first handheld GPU to playback H.264, WMV9 and MPEG-4 video up to D1 resolution at 30f/s. It is compatible with the main mobile TV standards such as DVB-H, ISDB-T and DMB networks and NVIDIA claims it enables play of console-class 3D games such as Quake III Arena at unrivalled speeds on a handheld device.

The GoForce 5500 offers crossfade and multistream technologies to stop music cut-out and breaks between songs and enables sharp digital photography with support for up to 10 megapixel resolution and rapid multi-shot capabilities.

NVIDIA said that phones based on the NVIDIA GoForce 5500 handheld GPU are expected to be available before this year's holiday season, from the main handset manufacturers.

Not a New Product

Kosan Biosciences to Present at the Leerink Swann Solid Tumors Roundtable Conference

346 words
7 May 2008
04:00
PR Newswire (U.S.)
PRN
English

HAYWARD, Calif., May 6 /PRNewswire-FirstCall/ -- Kosan Biosciences Incorporated (**Nasdaq**: KOSN) announced today that Jane Green, Kosan's Vice President, Corporate Communications, will present at the Leerink Swann Solid Tumors Roundtable Conference in New York at the Grand Hyatt Hotel on Friday, May 9, 2008 at 11:10 a.m. EDT. A live webcast of the presentation can be accessed through http://www.wsw.com/webcast/leerink15/kosn/.

Interested parties may also access a live webcast of the presentation by visiting the "Events Calendar" page under the "Investors/Press" tab on Kosan's website at http://www.kosan.com. A recorded replay of the presentations will be available for two weeks.

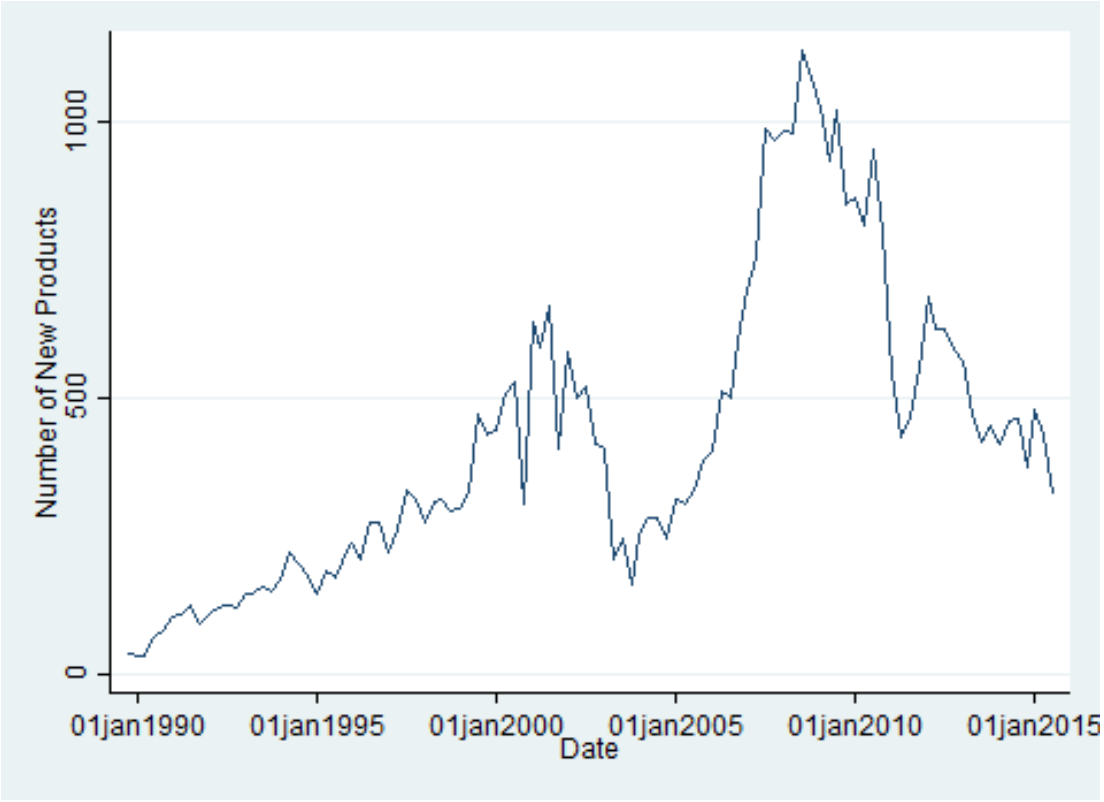
Methodology

- Estimate cumulative abnormal returns on the mentioned firm's stock over the two days after the release of the article
- Keep only those announcements where the firm mentioned in the article had a positive CAR(0,1)
- Final sample: 40,099 articles / 5,224 distinct firms
- Two measures:
  - Count number of announcements
  - Sum of CAR(0,1)$>$ 0 over the year/month

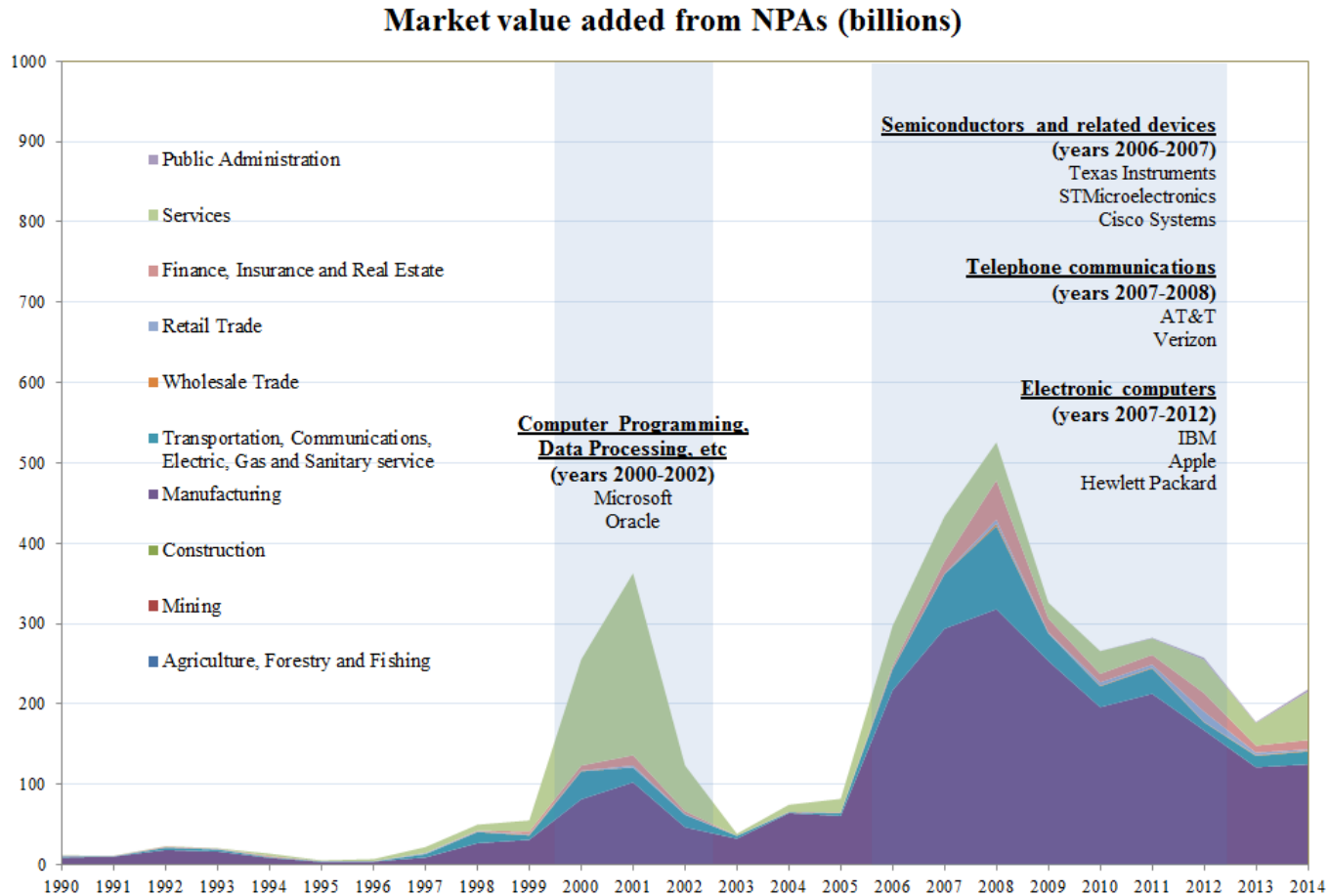
Summary Statistics

- Mean CAR(0,1)$>$ 0: 3%; \$ market value added: \$187m
- Aggregated annually: total mean CAR(0,1)$>$ 0: 5.1%; \$ market value added: \$310m
- Average innovating firm: 1.82 new products per year
- Every sixth public firm in the economy introduces a new product in a particular year

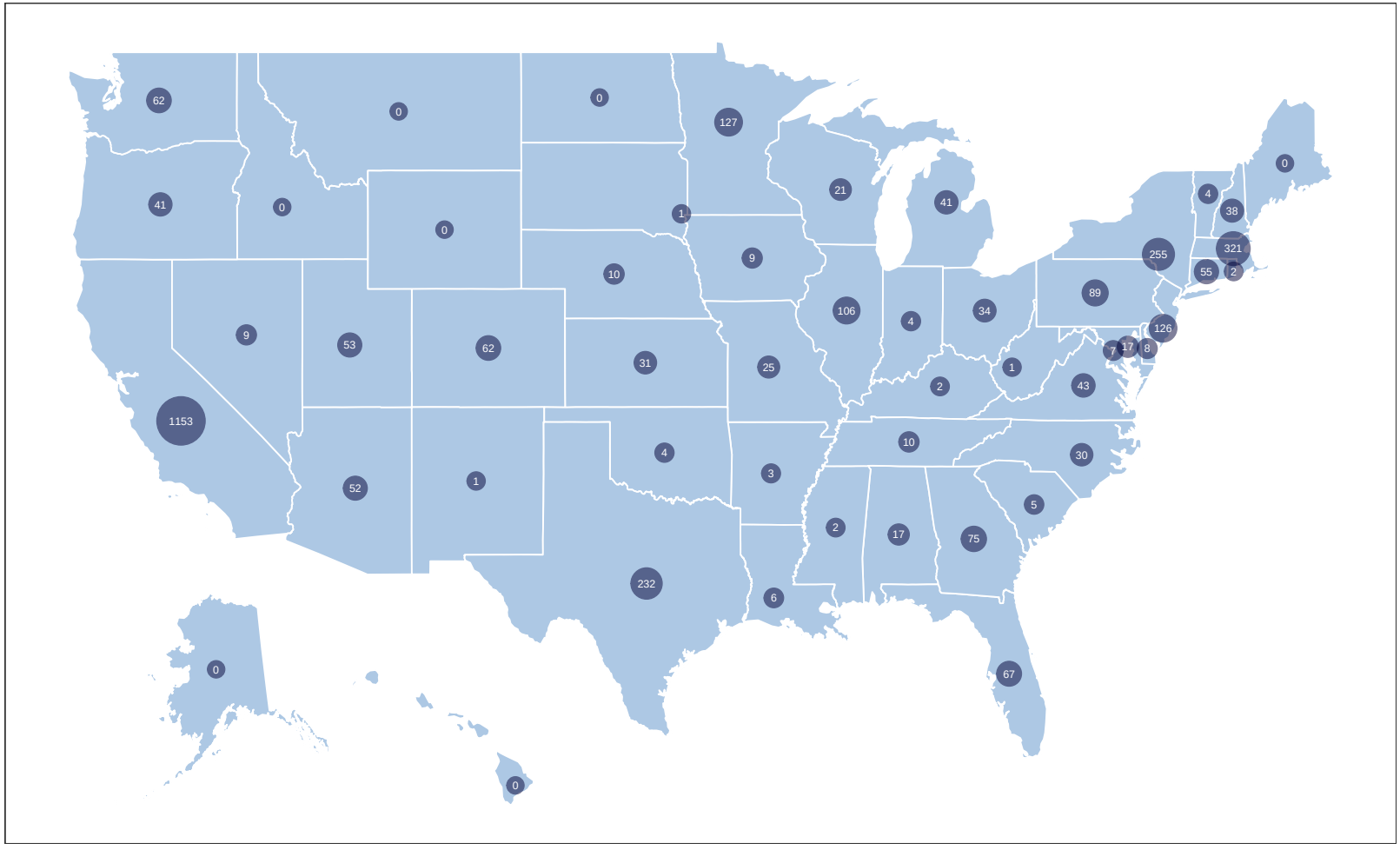
Trends Over Time: Number of New Products



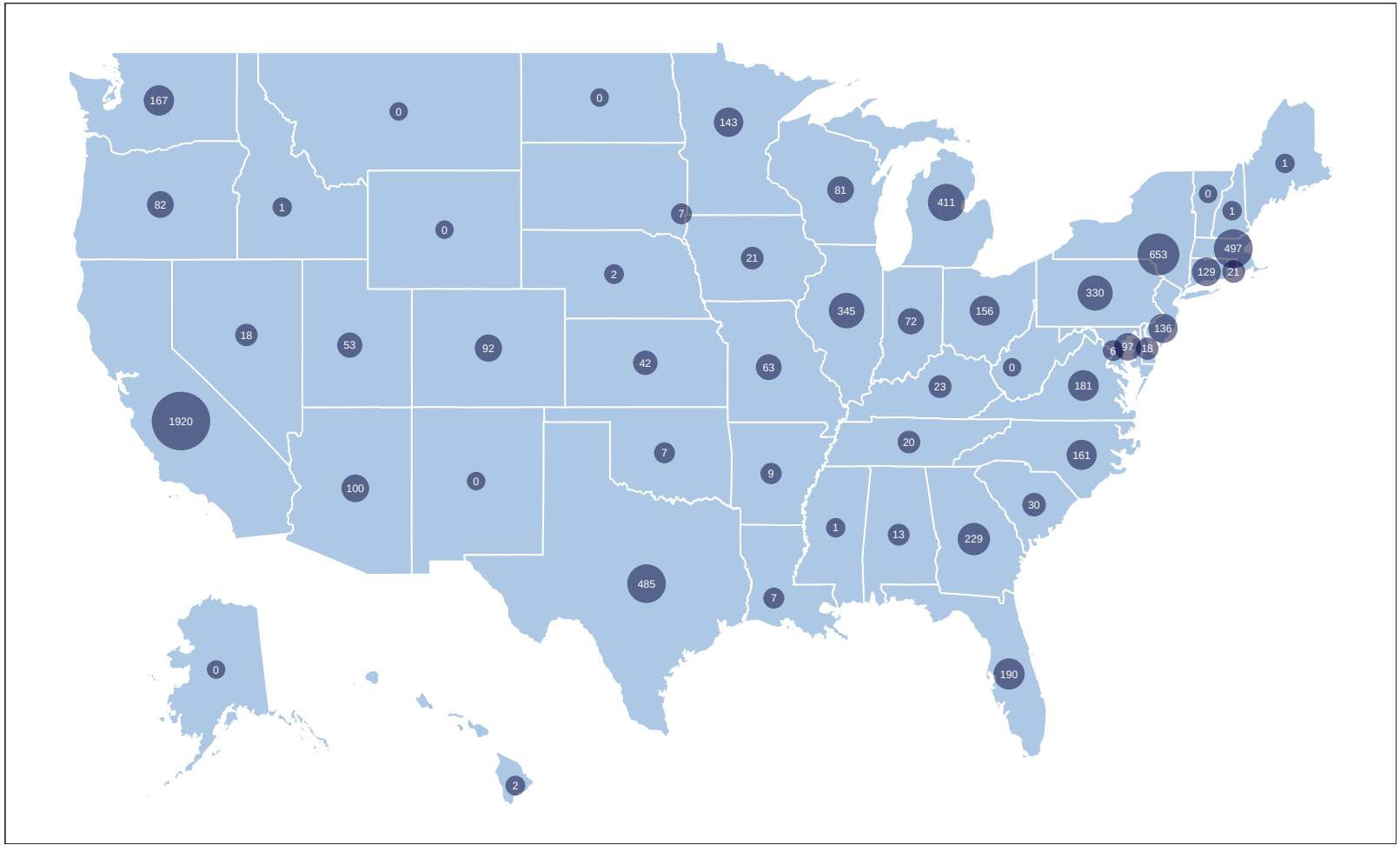
By Sectors and Firms



Geography (1989-1995): Number of New Products



Geography (2011-2015): Number of New Products



Characteristics of New Product Introductions

Persistence

- Innovation is persistent in general
  - Probability that a firm ranked in the top quintile is also ranked in the top quintile in the following year is 52.1%
  - New products are less persistent than R&D and patents– Respective figures for patents and R&D are 81.6% and 93.3%
- Larger firms have more new products

Fixed Effects (New Products)

	Number of New Products			Cumulative Abnormal Returns		
	(1)	(2)	(3)	(4)	(5)	(6)
Industry f.e.	Y	N	N	Y	N	N
Industry x Year f.e.	N	Y	N	N	Y	N
Firm f.e.	N	N	Y	N	N	Y
Year f.e.	Y	N	Y	Y	N	Y
R^2	0.161	0.259	0.433	0.127	0.215	0.379
N	153,993	153,993	177,443	153,993	153,993	177,443

Fixed Effects (Patents and R&D)

	R&D			Patents		
	(1)	(2)	(3)	(4)	(5)	(6)
Industry f.e.	Y	N	N	Y	N	N
Industry x Year f.e.	N	Y	N	N	Y	N
Firm f.e.	N	N	Y	N	N	Y
Year f.e.	Y	N	Y	Y	N	Y
R^2	0.561	0.607	0.933	0.282	0.342	0.843
N	153,989	153,989	177,439	153,993	153,993	177,443

Firm Characteristics

	Number of New Products					
	(1)	(2)	(3)	(4)	(5)	(6)
Sales	0.000***					0.000***
	(0.000)					(0.000)
Gross Margin		0.010***				0.013***
		(0.002)				(0.003)
PPE			0.000**			-0.000***
			(0.000)			(0.000)
Intangibles				0.000***		0.000***
				(0.000)		(0.000)
Employees					0.002***	0.000
					(0.000)	(0.000)
Firm f.e.	Y	Y	Y	Y	Y	Y
Year f.e.	Y	Y	Y	Y	Y	Y
R^2	0.382	0.382	0.380	0.393	0.381	0.396
N	159,965	157,247	155,806	144,869	149,905	129,163

Innovation Process

Our Measure Captures Innovation Beyond R&D or Patents

- Out of 5,224 firms that had at least one new product:
  - 1,978 have never filed patents during our sample period
  - 1,471 firms have not reported positive R&D expenditures
  - 981 firms (or 18.7%): neither R&D expenditures, nor patents
- Smaller firms are more likely not to have patents but larger firms are more likely not to report R&D
- Sectoral differences:
  - Firms with new products in Information Technologies and Health Care have patents or report R&D
  - Firms in Industrials, Consumer Discretionary, and Financials Sectors are likely not to have patents and report R&D but still produce new products by our measures

For Firms that Disclose New Products, R&D and Patents

- NPI has high correlation with patents, less robust with R&D
- Longer lag from R&D to new products than from patents to new products– consistent with common notions of innovation
- Firm level analysis consistent with industry level

Contemporaneous Correlation: Number of New Products

	Number of New Products					
	(1)	(2)	(3)	(4)	(5)	(6)
Patents	0.209***	0.092***				
	(0.020)	(0.020)				
R&D			0.164***	0.035		
			(0.017)	(0.021)		
Citations					0.146***	-0.029***
					(0.014)	(0.010)
Industry f.e.	N	Y	N	Y	N	Y
Year f.e.	Y	Y	Y	Y	Y	Y
R^2	0.182	0.536	0.162	0.534	0.158	0.534
N	20,925	20,925	20,925	20,925	20,925	20,925

Dynamics with R&D

	Number of New Products	Cumulative Abnormal Returns
	(1)	(2)
$R\&D_{t-1}$	-0.016	-0.018
	(0.020)	(0.027)
$R\&D_{t-2}$	-0.006	-0.012
	(0.019)	(0.026)
$R\&D_{t-3}$	0.011	0.022
	(0.020)	(0.027)
$R\&D_{t-4}$	0.084***	0.092***
	(0.021)	(0.026)
Industry f.e.	Y	Y
Year f.e.	Y	Y
R^2	0.560	0.529
N	17,577	17,577

Dynamics with Patents

	Number of New Products	Cumulative Abnormal Returns
	(1)	(2)
$Patents_{t-1}$	0.011	0.008
	(0.016)	(0.021)
$Patents_{t-2}$	0.015	0.014
	(0.014)	(0.018)
$Patents_{t-3}$	0.042***	0.043**
	(0.014)	(0.017)
$Patents_{t-4}$	0.085***	0.090***
	(0.016)	(0.019)
Industry f.e.	Y	Y
Year f.e.	Y	Y
R^2	0.562	0.531
N	17,577	17,577

Stylized Facts

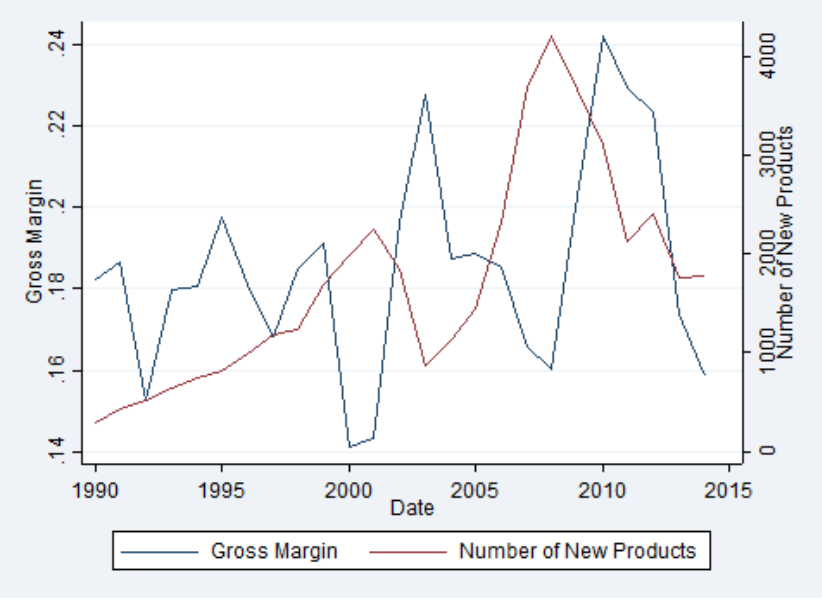
Stylized Facts

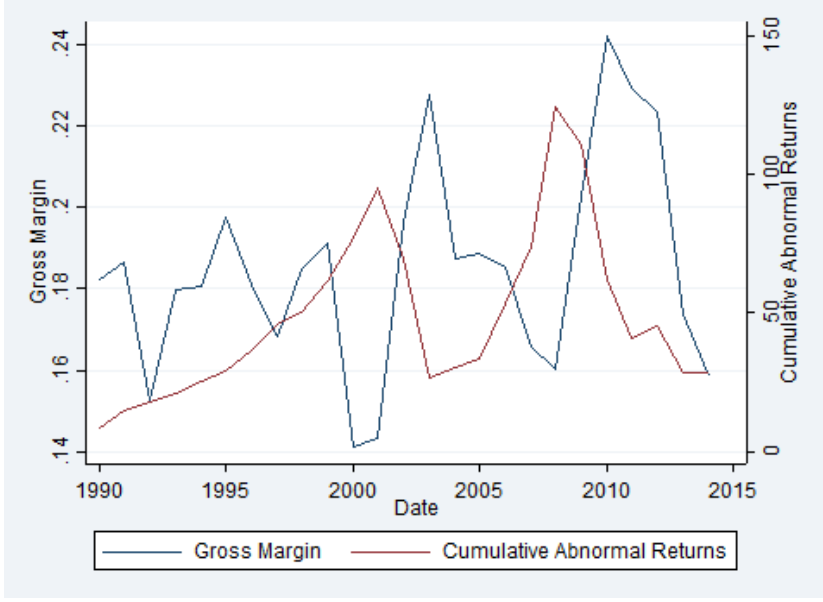
- Competitive environment
- Productivity

Competitive Environment

1. More new products in less concentrated industries and when firm has more direct rivals
2. New product announcements are correlated among rival peer groups
3. Competitive industries do not have concentrated new product announcements
4. Concentration of new product announcements started rising

Gross Profit Margins





Competitive Environment: Industry Level

	Number of New Products	Cumulative Abnormal Returns	Patents (Bena et al., 2017)	Patents (Kogan et al., 2017)	Log R&D
	(1)	(2)	(3)	(4)	(5)
HHI	-0.542***	-0.467**	-0.114	-0.352	-0.380
	(0.177)	(0.207)	(0.320)	(0.353)	(0.410)
Assets	0.077**	0.089**	0.531***	0.536***	0.550***
	(0.037)	(0.041)	(0.072)	(0.073)	(0.088)
Industry f.e.	Y	Y	Y	Y	Y
Year f.e.	Y	Y	Y	Y	Y
R^2	0.653	0.609	0.833	0.867	0.887
N	6,163	6,163	6,163	6,163	6,163

Competitive Environment: Firm Level

	Number of New Products		Cumulative Abnormal Returns	
	(1)	(2)	(3)	(4)
TNIC3-HHI	-0.103***		-0.014***	
	(0.021)		(0.004)	
TNIC3-Similarity		0.002***		0.000***
		(0.000)		(0.000)
Firm f.e.	Y	Y	Y	Y
Year f.e.	Y	Y	Y	Y
R^2	0.406	0.405	0.350	0.350
N	100,921	100,921	100,921	100,921

Rivals

	Number of New Products			Cumulative Abnormal Returns		
	(1)	(2)	(3)	(4)	(5)	(6)
Rival NPA	0.117***	0.039***	0.221***	0.111***	0.040***	0.268***
	(0.006)	(0.004)	(0.011)	(0.007)	(0.004)	(0.019)
Firm f.e.	Y	Y	Y	Y	Y	Y
Year f.e.	Y	Y	Y	Y	Y	Y
R^2	0.392	0.387	0.405	0.336	0.327	0.342
N	175,755	175,755	149,262	175,755	175,755	149,262

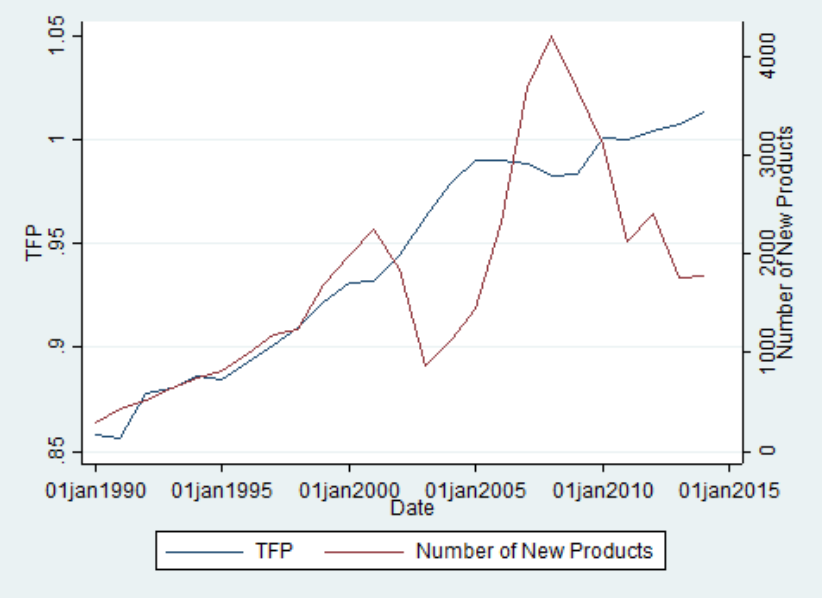
Concentrated Industries and Concentrated Products

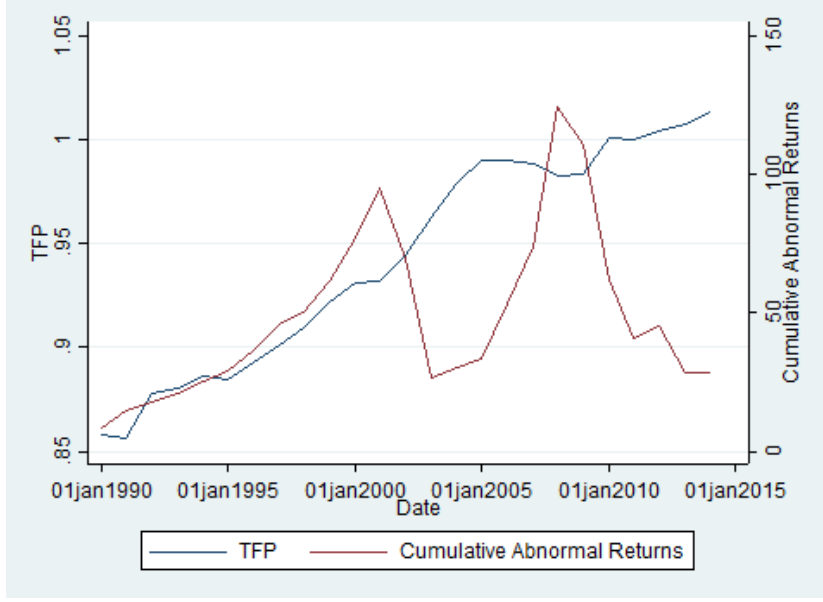
	Concentration of New Products	
	(1)	(2)
HHI	0.181**	0.170**
	(0.086)	(0.082)
Number of Firms		-0.004*
		(0.002)
Assets		0.021
		(0.014)
Industry f.e.	Y	Y
Year f.e.	Y	Y
R^2	0.151	0.159
N	3,668	3,668

Productivity

1. Cross-sectionally, productivity at both the industry and the firm level is correlated with new product announcements
2. Similar trends with value added and value of shipments

Aggregate Productivity Trends





Industry-level TFP

	Number of New Products		Cumulative Abnormal Returns	
	(1)	(2)	(3)	(4)
5-factor TFP Index	0.082***		0.081***	
	(0.003)		(0.004)	
4-factor TFP Index		0.082***		0.081***
		(0.003)		(0.004)
Industry f.e.	Y	Y	Y	Y
Year f.e.	Y	Y	Y	Y
R^2	0.578	0.578	0.552	0.552
N	9,084	9,084	9,084	9,084

Firm-level TFP from Olley-Pakes Estimates

	Number of New Products		Cumulative Abnormal Returns	
	(1)	(2)	(3)	(4)
Single Function	0.042***		0.010***	
	(0.016)		(0.003)	
Industry Function		0.032**		0.008**
		(0.015)		(0.003)
Firm f.e.	Y	Y	Y	Y
Year f.e.	Y	Y	Y	Y
R^2	0.413	0.413	0.389	0.390
N	40,991	41,223	40,991	41,223

Taking Stock

- We suggest a way to measure new product launches based on media articles
- Competitive industries and industries with higher levels of productivity are associated with higher new product introduction intensity
- Product launches are typically followed by higher competition