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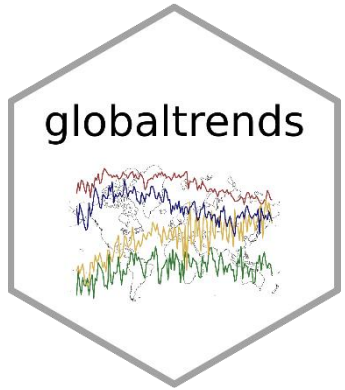


Let Me Google That for You
Measuring global trends using Google Trends

Harald Puhr & Jakob Müllner

useR! – 2021-07-06

Agenda

- What does `globaltrends` do?
- What can you do with `globaltrends`?
- Why should you care?

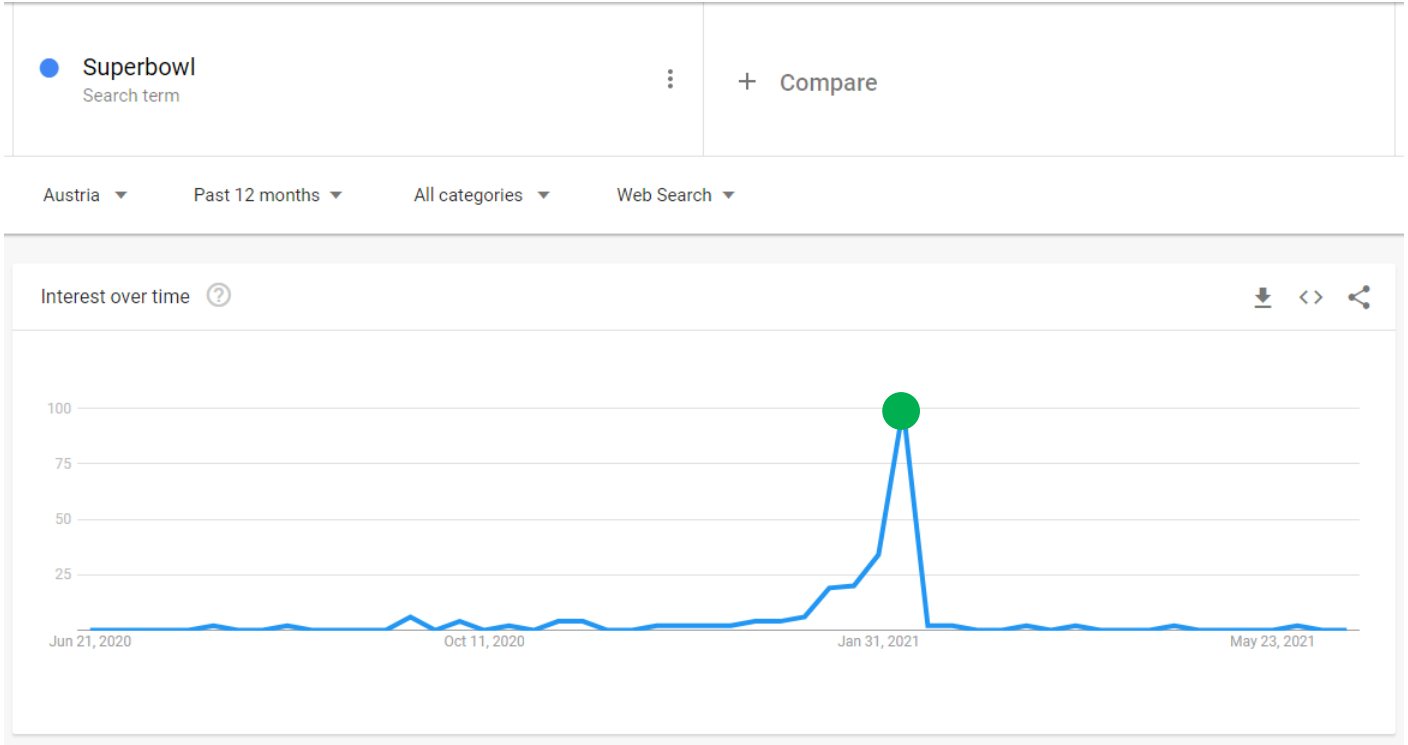
1

WHAT DOES GLOBALTRENDS DO?

The `globaltrends` package

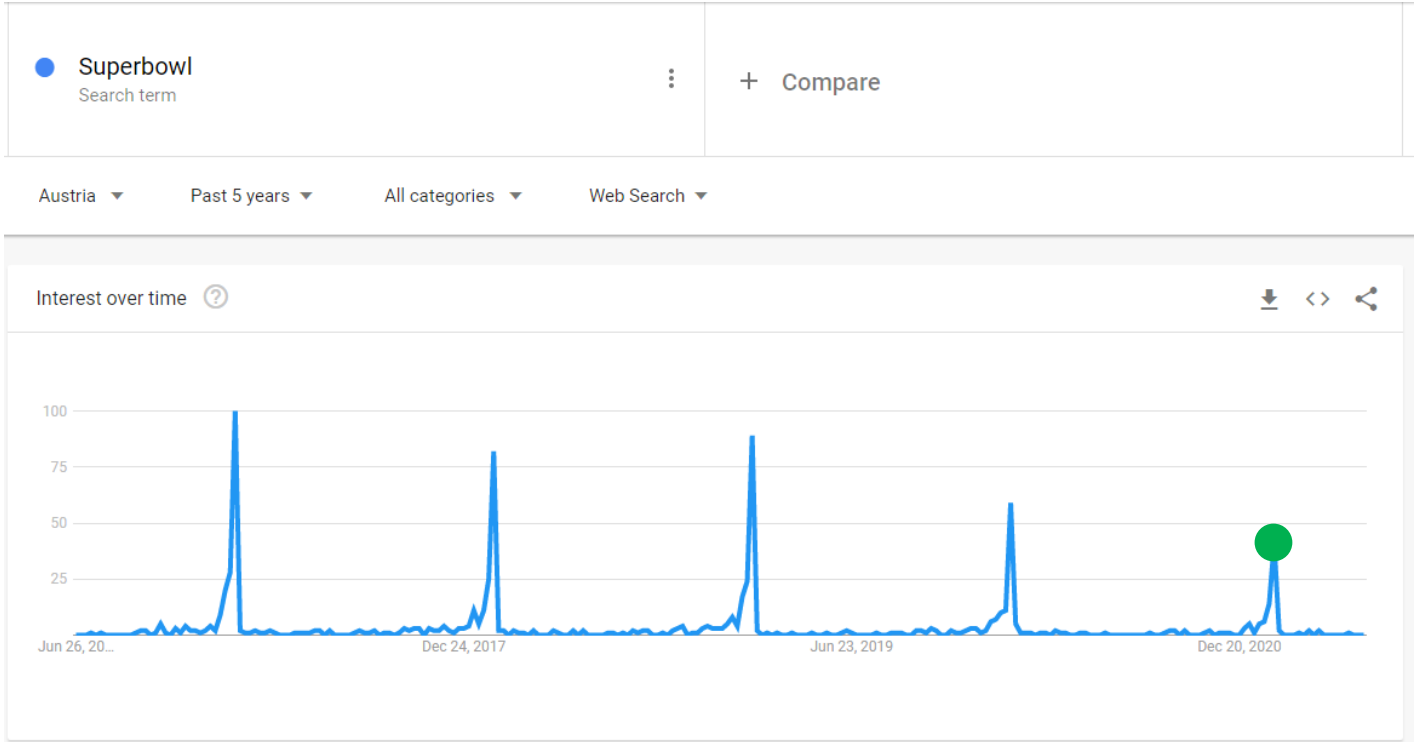
- The `globaltrends` package allows users to download and analyze the dispersion and development of global trends with data from Google Trends
  - Functions to download and compute data
  - Functions to export data
  - Functions to visualize data
  - Data storage in SQLite file
- “One stop solution” to work with data from Google Trends
- Available on GitHub: https://github.com/ha-pu/globaltrends
- Code example enclosed

Google Trends…



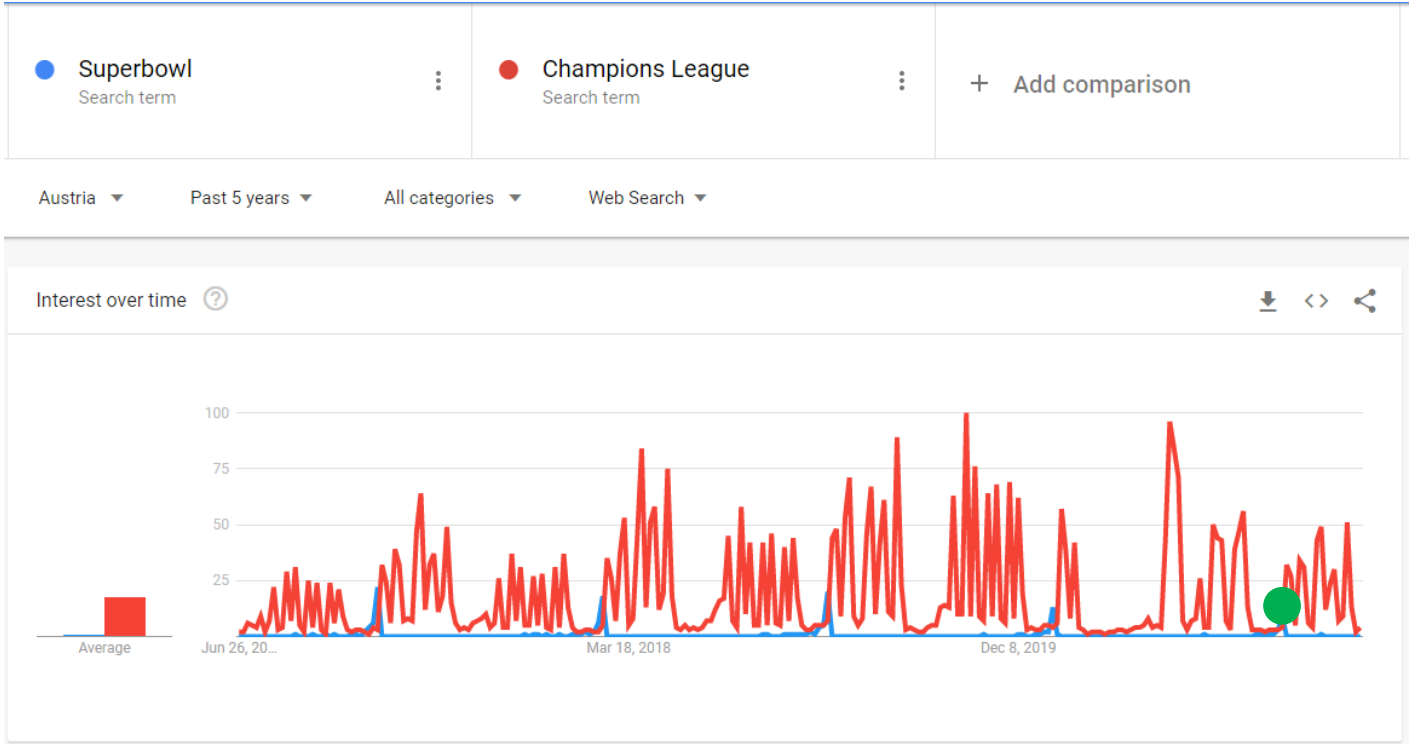
https://trends.google.com/trends/explore?geo=AT&q=Superbowl

…normalizes data based on time…



https://trends.google.com/trends/explore?date=today%205-y&geo=AT&q=Superbowl

…and keyword combination



https://trends.google.com/trends/explore?date=today%205-y&geo=AT&q=Superbowl

Solution: re-normalization

- `globaltrends` re-normalizes data from Google Trends
  - „Object“ keyword and „control“ keywords
  - Data not relative to search query but control keywords
  - Up to five keywords that mirror „standard“ internet usage
  - Examples: gmail, maps, translate, wikipedia, youtube
- Users set their own control keywords
  - Control keywords worked well so far
  - But control keywords are context-dependent

$$search\ score_o = \frac{search\ volume_o}{\sum search\ volume_c}$$

- Built-in time-series adjustments
  - Seasonal adjusted data
  - Trend-only data

Two measures for internationalization

- Degree of internationalization: dispersion of search scores
  - Indicator for equality of search volumes across locations
  - Inverted Gini coefficient
  - Inverted Herfindahl index
  - Inverted entropy
  - Unweighted data
- Volume of internationalization: global search scores
  - Indicator for total amount of search volumes
  - Weighted data

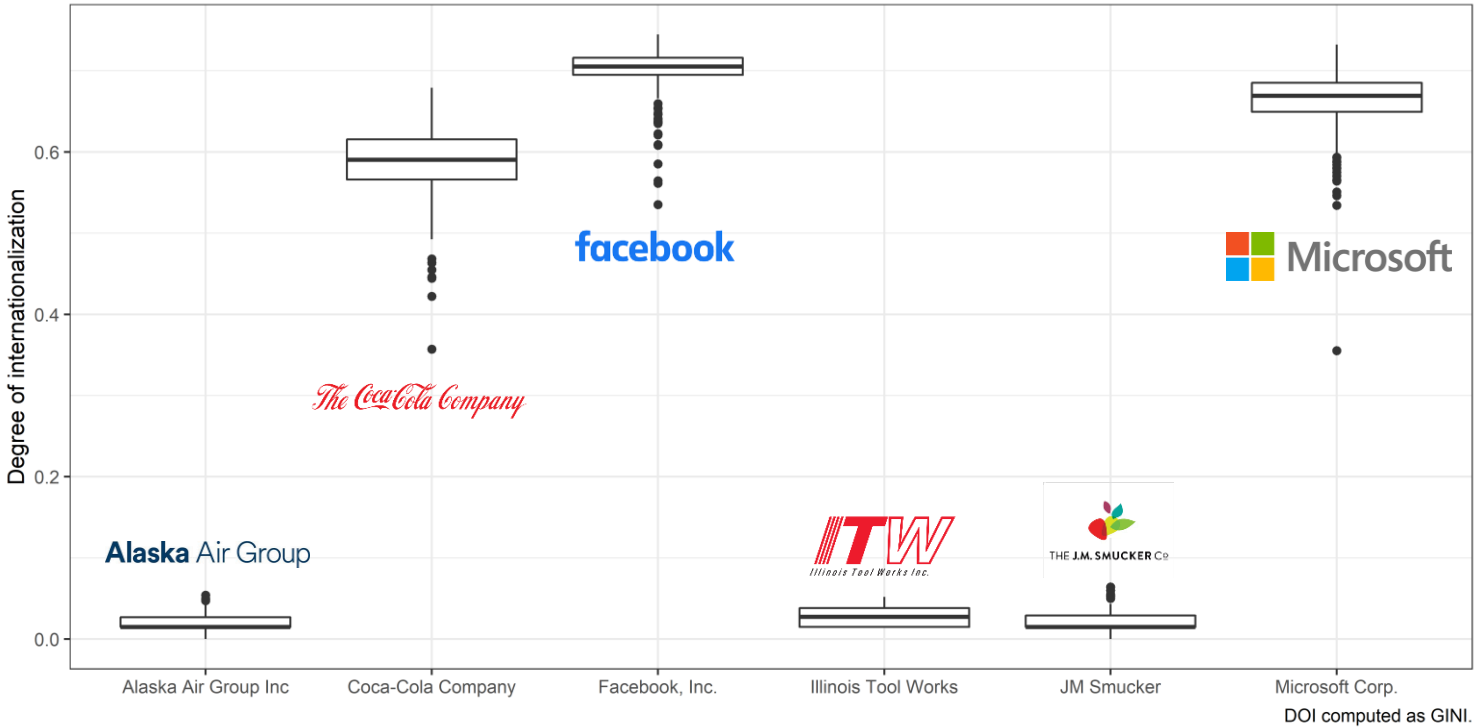
globaltrends workflow

Setup	`initialize_db()`, `start_db()`, `disconnect_db()`, `add_control_keyword()`, `add_object_keyword()`
Download data	`download_control()`, `download_control_global()` `download_object()`, `download_object_global()`
Compute data	`compute_score()`, `compute_voi()`, `compute_doi()`
Export data	`export_score()`, `export_voi()`, `export_doi()`
Visualize data	`plot_bar()`, `plot_ts()`, `plot_box()`

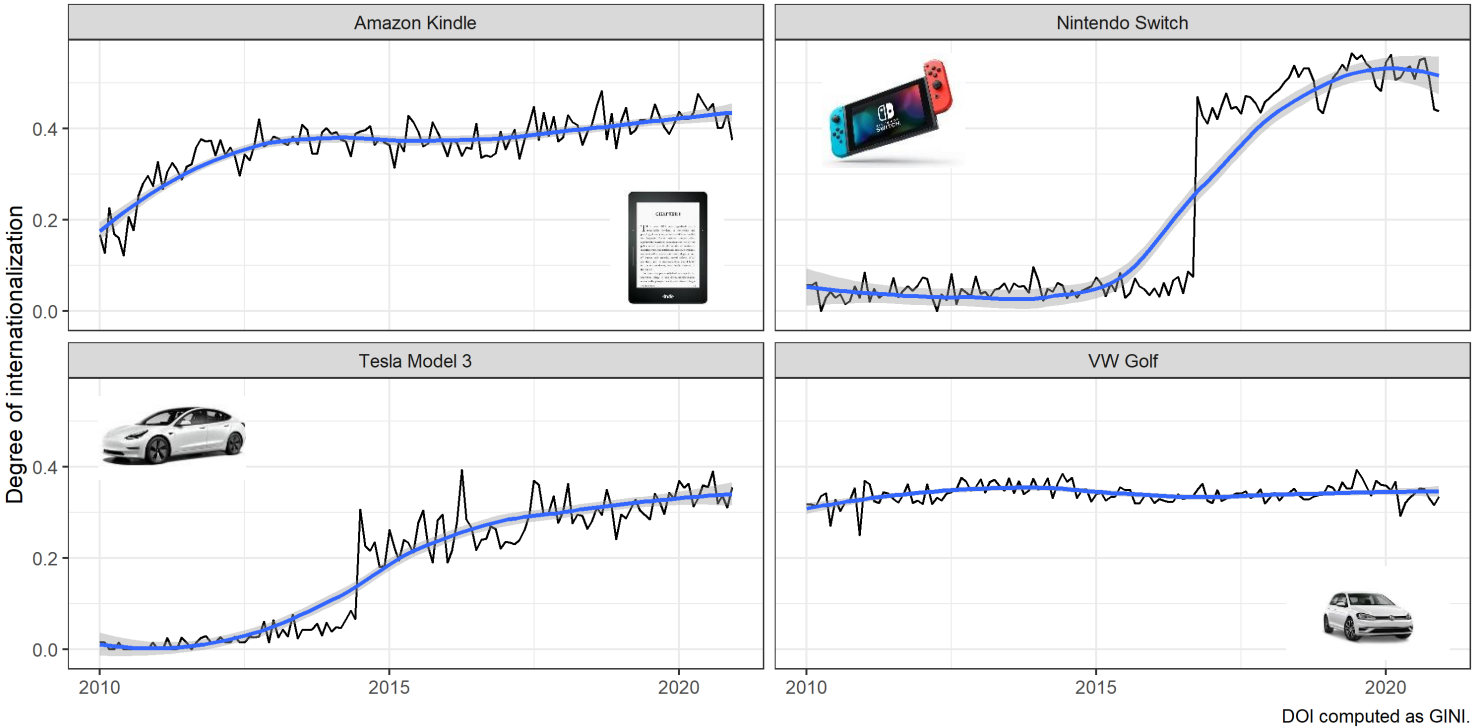
2

WHAT CAN YOU DO WITH GLOBALTRENDS?

Internationalization of firms



Internationalization of products



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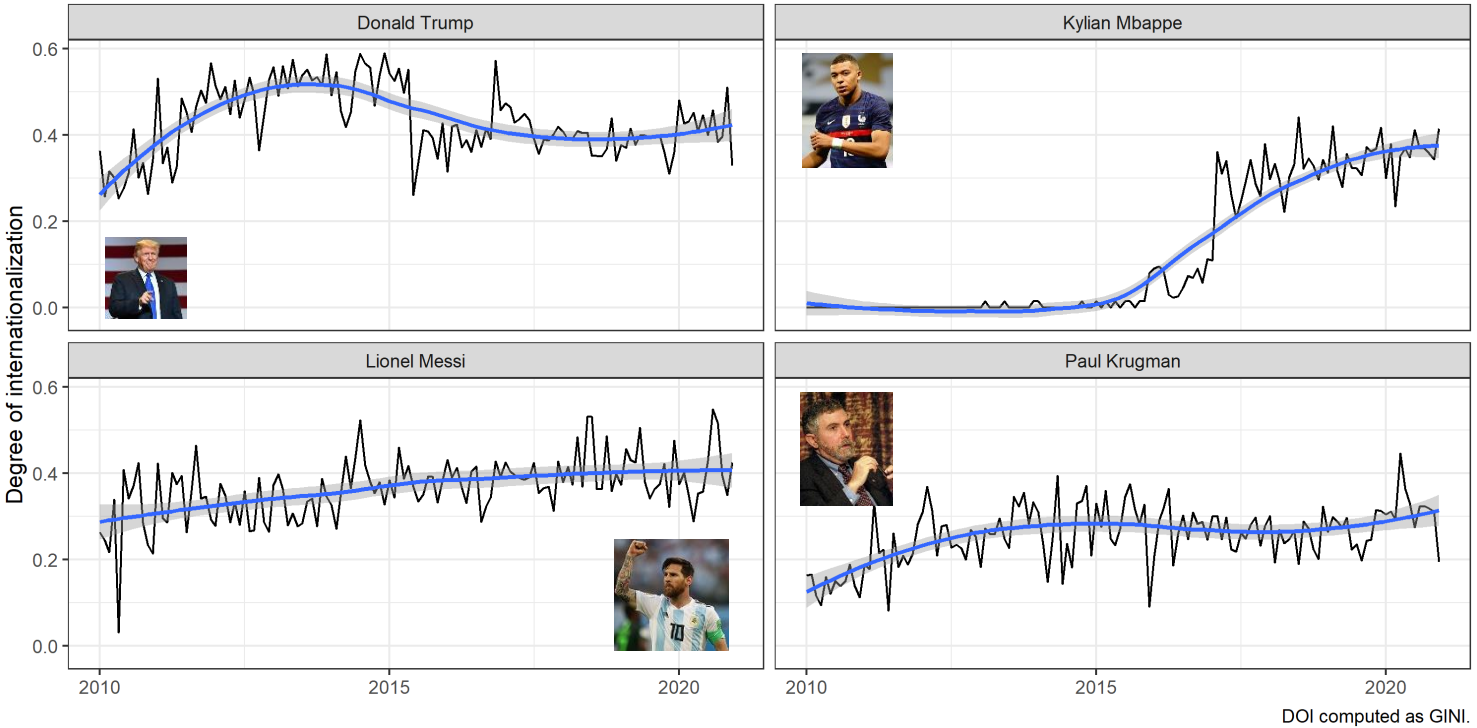
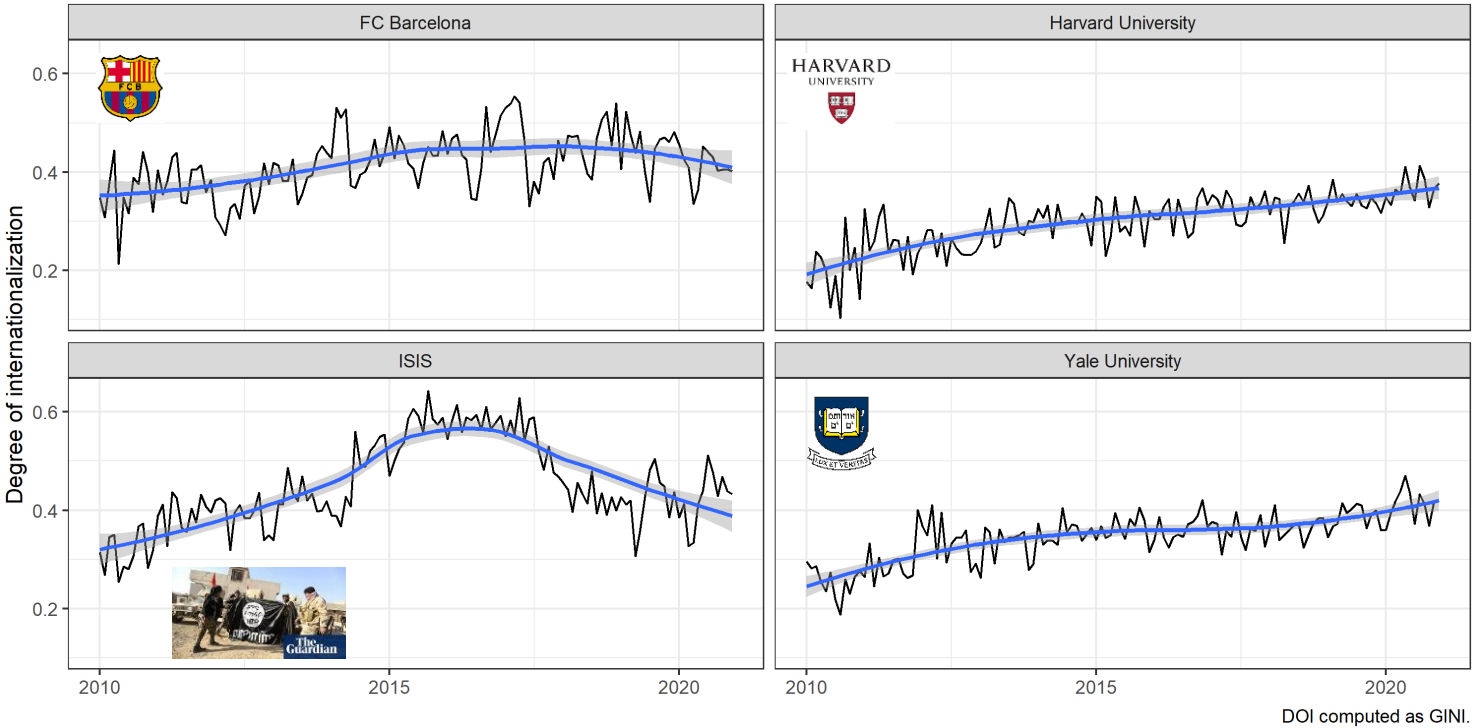
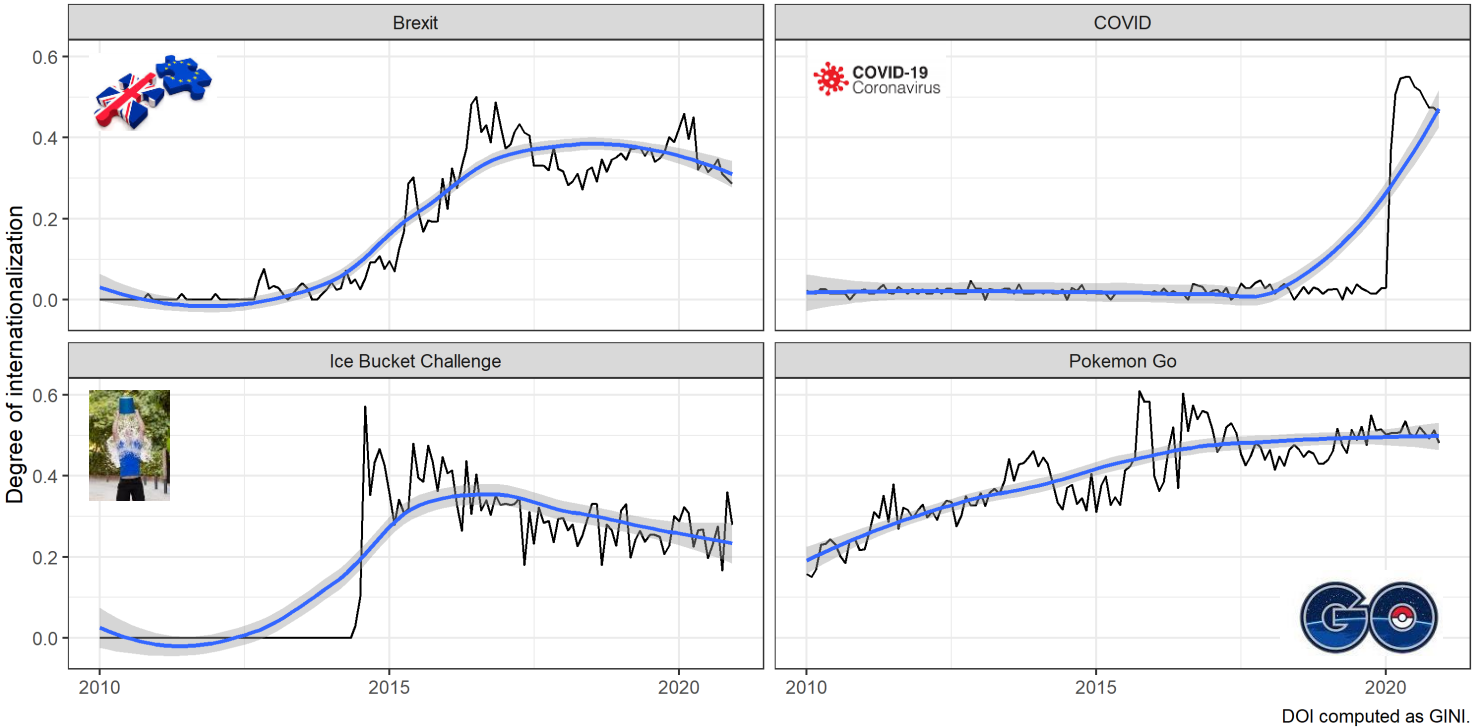
Internationalization of individuals



Internationalization of non-corporate organizations

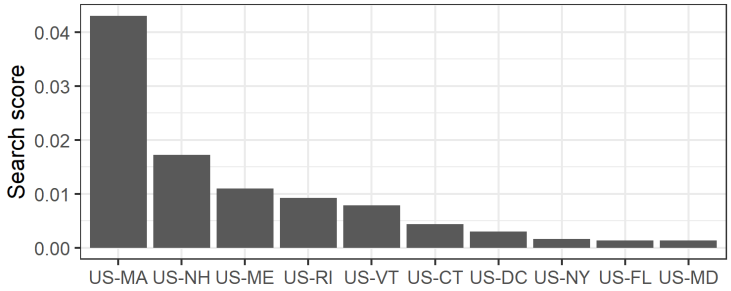


Internationalization of trends and phenomena



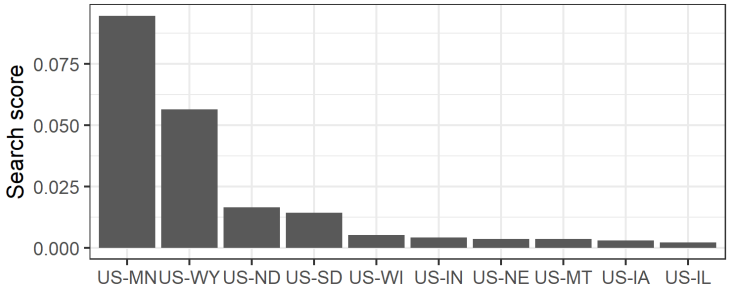
Within-country dispersion

The Boston Globe



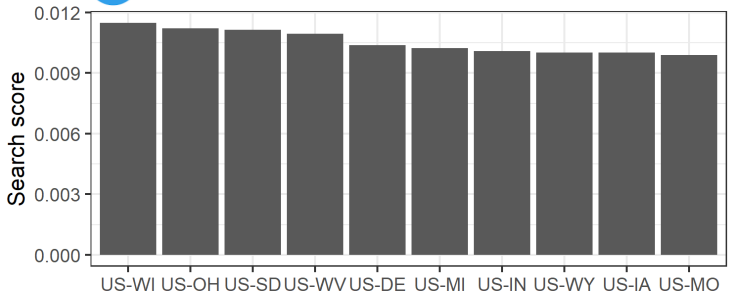
Search score as OBS time series.

StarTribune



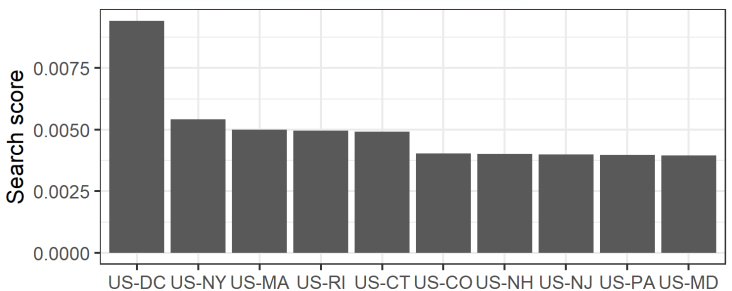
Search score as OBS time series.

USA TODAY



Search score as OBS time series.

THE WALL STREET JOURNAL.

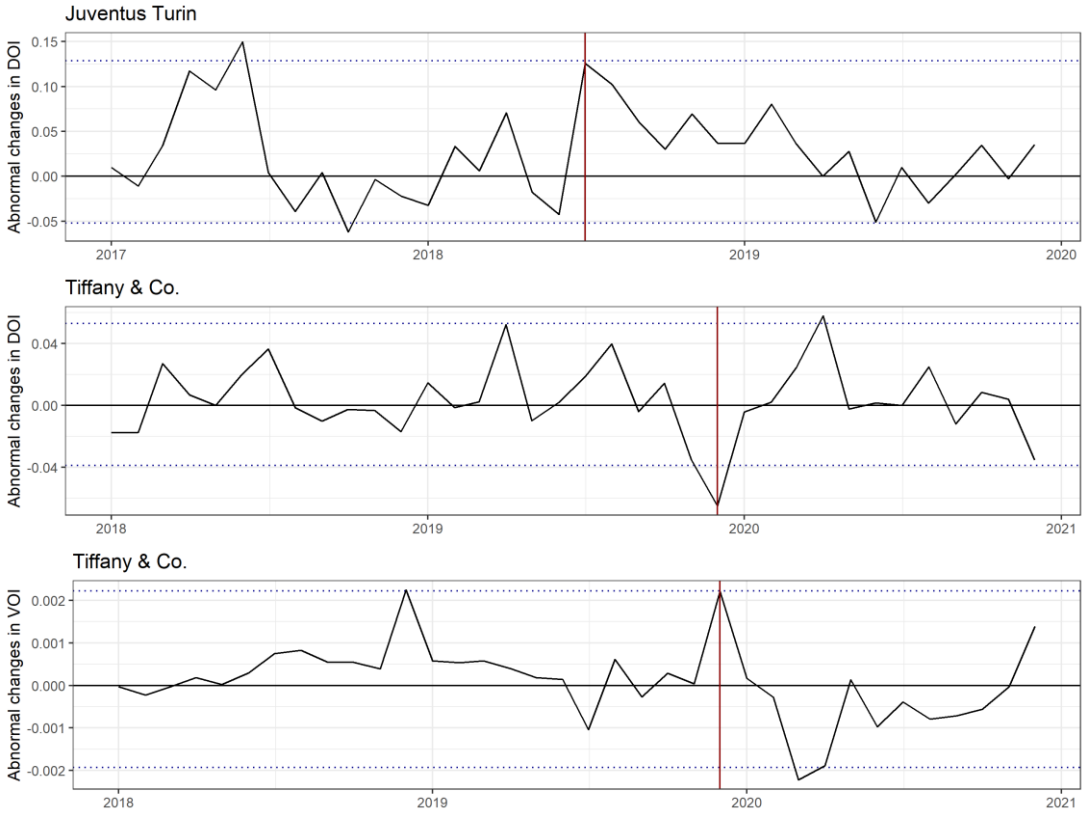


Search score as OBS time series.

Event studies

Cristiano Ronaldo Transfer

Announced acquisition by LVMH



TIFFANY & CO.

LVMH

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WHY SHOULD YOU CARE?

Why you should care about `globaltrends`...

- Academics and practitioners
  - Access to Google Trends as amazing data source
  - Re-normalization allows large scale data analysis
  - SQLite database to share data
- `R` users
  - We do not replace `gtrendsR` -> we use `gtrendsR`
  - System of functions that build around data accessed through `gtrendsR`
  - “One stop solution”
- `R` developers
  - Who is your average user?
  - Most people in academia do not use `R` -> they cope with `R`
  - Make the package comfortable for the type of user you target

Thank you!

Package and documentation available on GitHub:
https://github.com/ha-pu/globaltrends

`globaltrends` is work in progress:
Comments, suggestions, bug reports,
recommendations are highly welcome and appreciated!

Q&A

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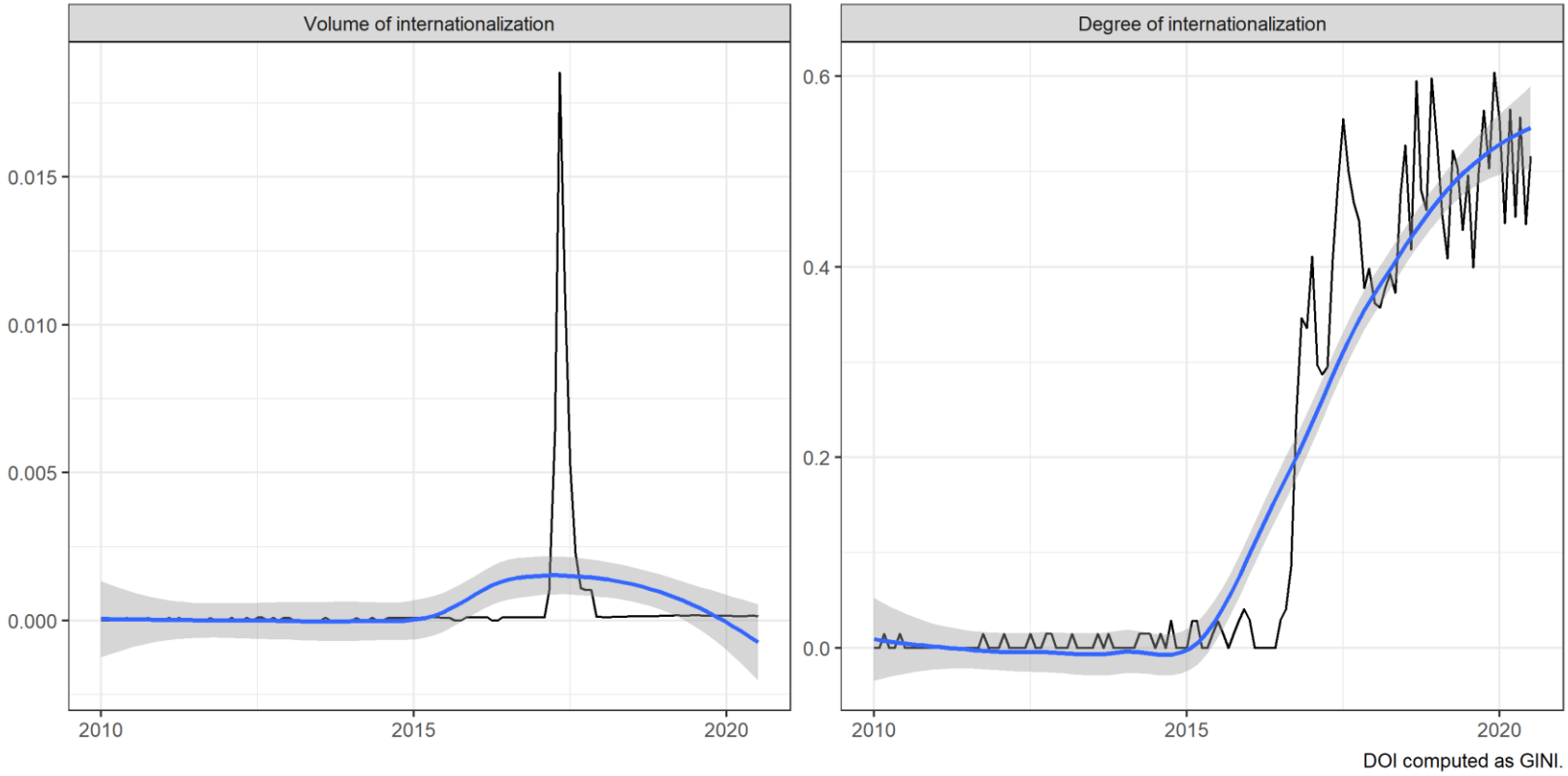
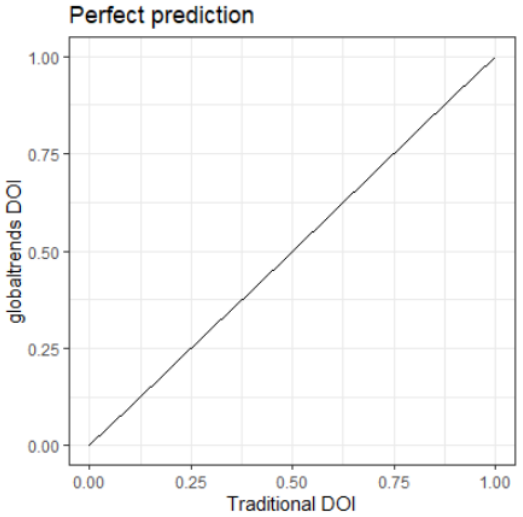
Fidget Spinner example DOI vs. VOI



Predictive Robustness

- To test for biases we create a predictive model and predict global trends DOI with traditional DOI measures
  - Compound of RIMS, TNCI, FSTS
  - Number of foreign countries with subsidiaries
  - Share of foreign subsidiaries
- A perfect predictive relationship would yield
  - $\beta = 1$ and
  - $R^2 = 1$
- To test for biases, we interact covariates for potential sources of bias
  - Language, Internet usage, China….



Predictive Robustness

- Predictive validity and reliability of traditional measures is significant and positive in all specifications
  - Traditonal DOI
  - Number of foreign countries
  - Share of foreign subsidiaries
- However, coefficients and R^2 indicate conceptual differences

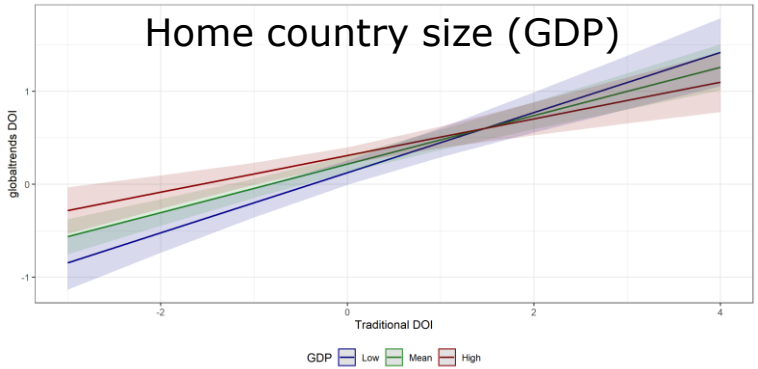
	globaltrends DOI		
	(1)	(2)	(3)
Traditional DOI	0.259***		
	p = 0.000		
Number of foreign countries		0.338***	
		p = 0.000	
Share of foreign subsidiaries			0.135***
			p = 0.000
Constant	0.269***	-0.001	-0.002
	p = 0.000	p = 0.964	p = 0.940
Observations	1,103	1,025	1,025
Dataset fixed effects		Included	
R^2	0.150	0.114	0.018
Adjusted R^2	0.148	0.113	0.017

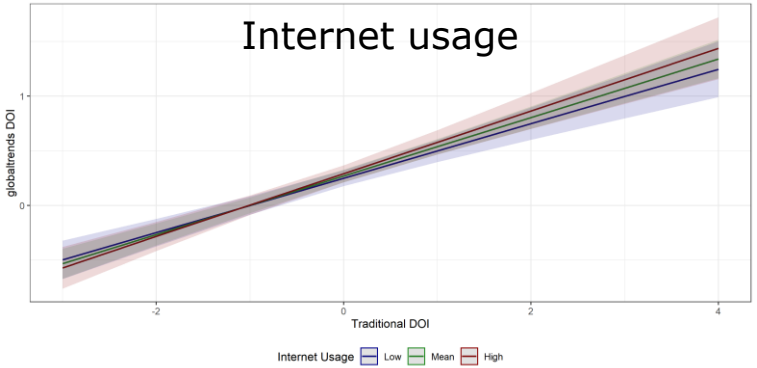
Country biases

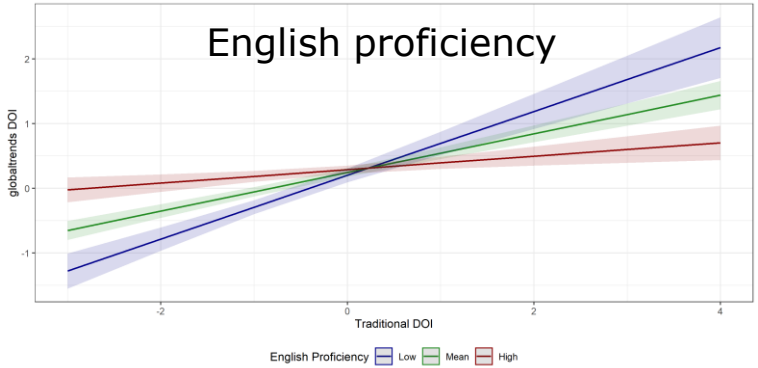
- We observe very small home country size bias
- DOI measures are biased towards English speaking and English proficient countries
- Language biases do not compromise predictive validity and can be controlled with dummy variable for English native language

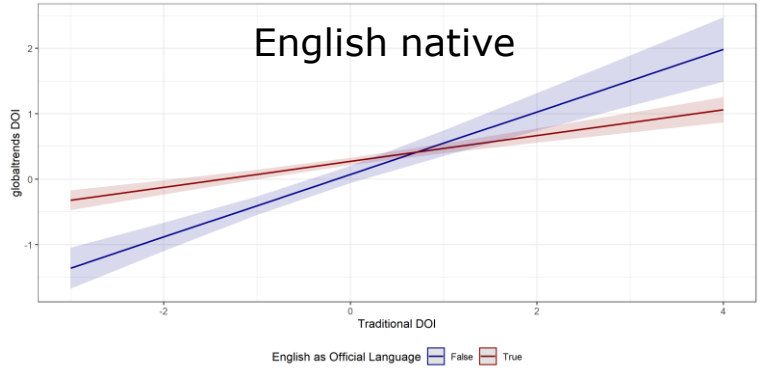
	globaltrends DOI				
	(4)	(5)	(6)	(7)	(8)
Traditional DOI	0.371***	0.224***	0.223***	0.370***	0.427***
	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.000
GDP	0.049***				
	p = 0.008				
GDP/capita		0.332***			
		p = 0.001			
Internet usage			0.077		
			p = 0.605		
English proficiency				0.054	
				p = 0.190	
English as official language					0.187***
					p = 0.019
Traditional DOI x GDP	-0.034**				
	p = 0.034				
Traditional DOI x GDP/capita		0.053			
		p = 0.521			
Traditional DOI x Internet usage			0.092		
			p = 0.506		
Traditional DOI x English proficiency				-0.185***	
				p = 0.000	
Traditional DOI x English as official language					-0.236***
					p = 0.000
Constant	0.057	0.110*	0.238***	0.217***	0.086
	p = 0.521	p = 0.077	p = 0.002	p = 0.000	p = 0.326
Observations	1,096	1,096	1,098	1,089	1,099
Dataset fixed effects			Included		
R^2	0.161	0.161	0.152	0.171	0.164
Adjusted R^2	0.157	0.157	0.148	0.167	0.161

Home country biases







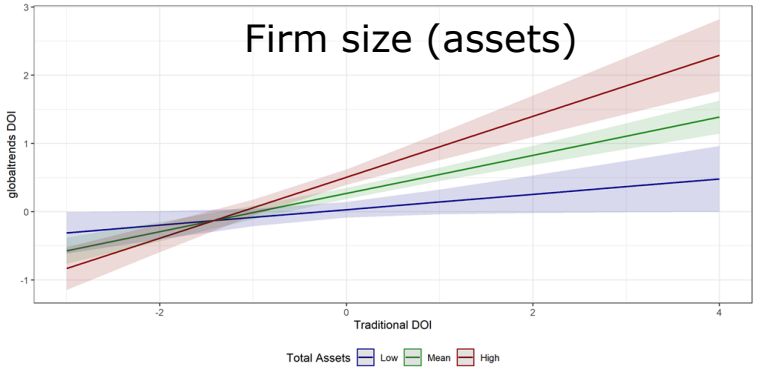


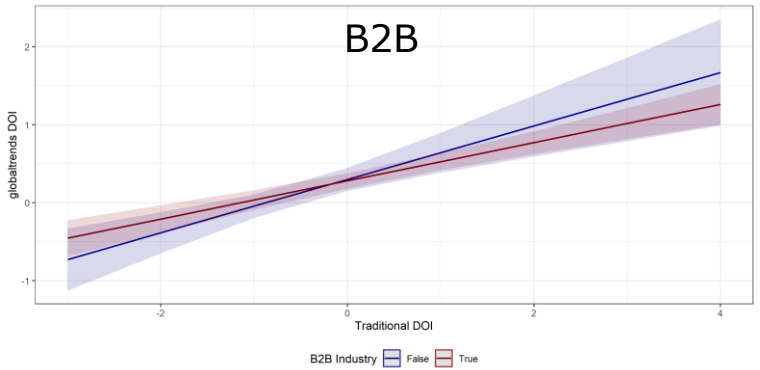
Firm biases

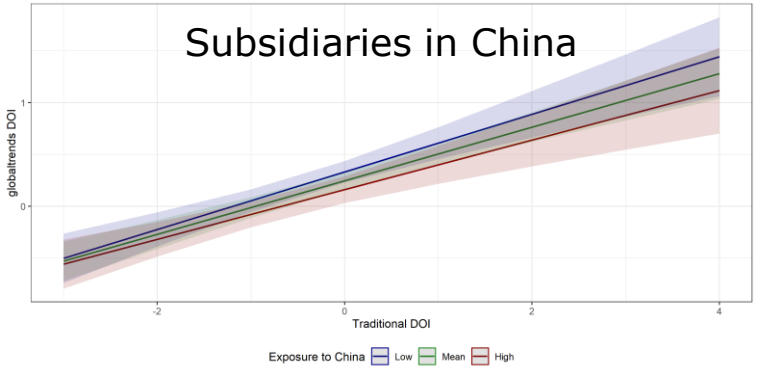
- We observe a small bias for firm size
- DOI measures not affected by B2B operations and exposure to China
- Size bias does not compromise predictive validity and can be controlled with firm size controls

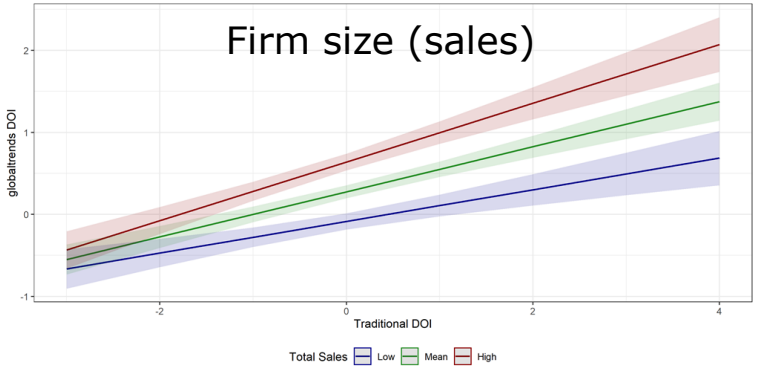
	globaltrends DOI				
	(9)	(10)	(11)	(12)	(13)
Traditional DOI	0.273***	0.265***	0.280***	0.343***	0.258***
	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.000
Total sales	0.322***				
	p = 0.000				
Number of employees		0.268***			
		p = 0.000			
Total assets			0.248***		
			p = 0.000		
B2B industry				-0.019	
				p = 0.825	
Exposure to China					-0.097**
					p = 0.043
Traditional DOI x Total sales	0.073***				
	p = 0.003				
Traditional DOI x Number of employees		0.104***			
		p = 0.001			
Traditional DOI x Total assets			0.174***		
			p = 0.001		
Traditional DOI x B2B industry				-0.097	
				p = 0.244	
Traditional DOI x Exposure to China					-0.022
					p = 0.547
Constant	0.265***	0.253***	0.268***	0.300***	0.244***
	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.000
Observations	1,077	1,074	1,075	1,093	1,084
Dataset fixed effects			Included		
R^2	0.238	0.205	0.174	0.152	0.153
Adjusted R^2	0.234	0.202	0.170	0.148	0.149

Firm biases

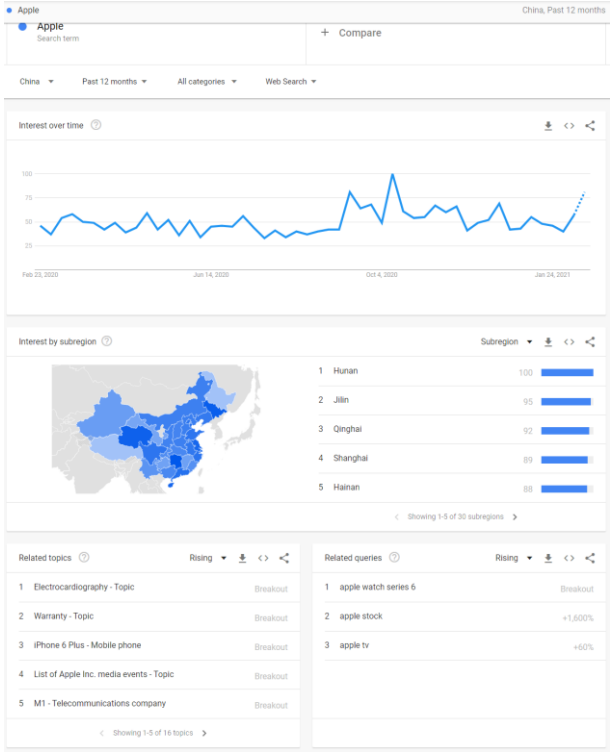

Firm size (assets)
globaltrends DOI
Traditional DOI
Total Assets Low Mean High

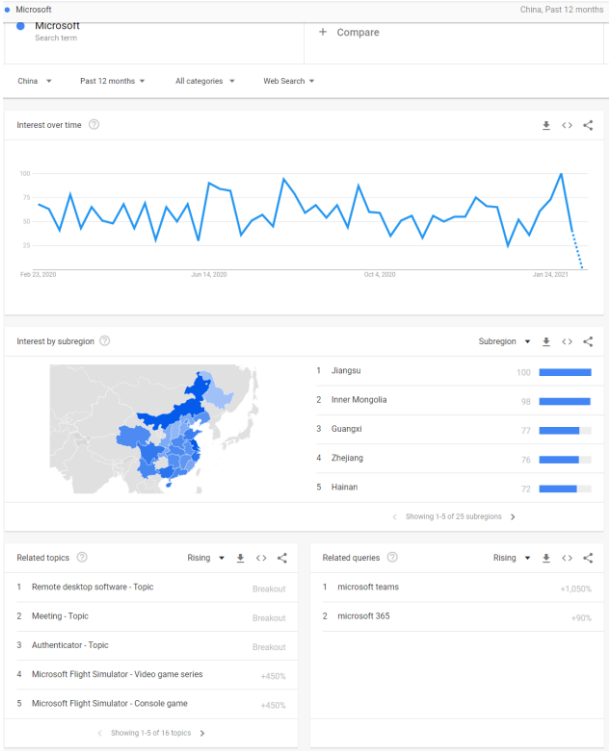

B2B
globaltrends DOI
Traditional DOI
B2B Industry False True


Subsidiaries in China
globaltrends DOI
Traditional DOI
Exposure to China Low Mean High


Firm size (sales)
globaltrends DOI
Traditional DOI
Total Sales Low Mean High

Google Trends results for China





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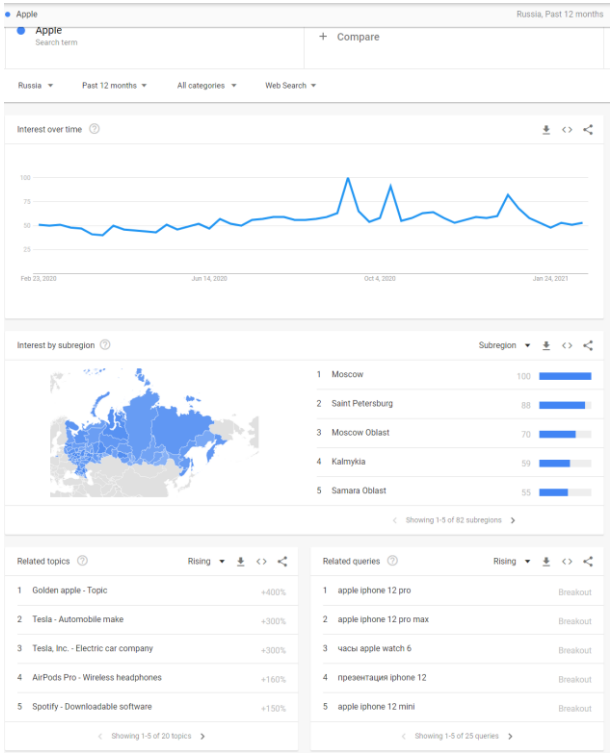
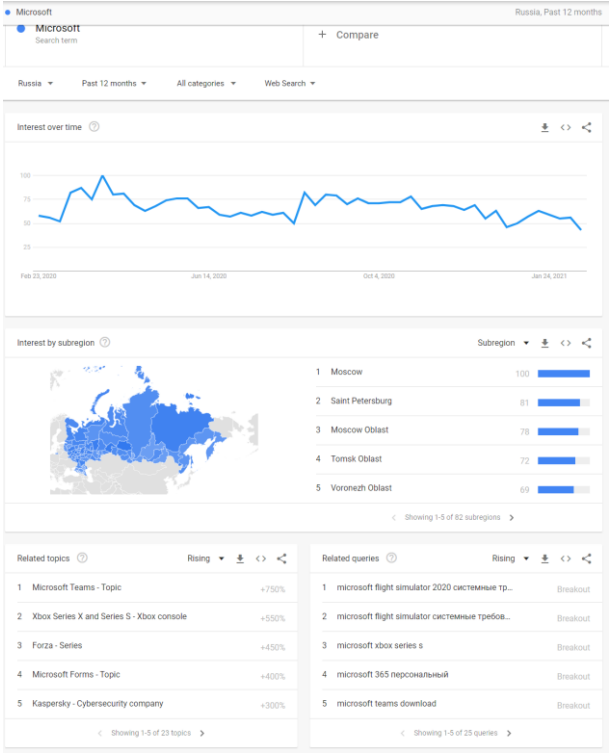
https://trends.google.com/trends/explore?geo=CN&q=Microsoft

Google Trends results for Russia





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https://trends.google.com/trends/explore?geo=RU&q=Microsoft