



Twitter and citations

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ABSTRACT

Social media, especially Twitter, plays an increasingly important role among researchers in showcasing and promoting their research. Does Twitter affect academic citations? Making use of Twitter activity about columns published on VoxEU, a renowned online platform for economists, we develop an instrumental variable strategy to show that Twitter activity about a research paper has a causal effect on the number of citations that this paper will receive. We find that the existence of at least one tweet, as opposed to none, increases citations by 16–25%. Doubling overall Twitter engagement boosts citations by up to 16%.

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1. Introduction

Social media has become an essential tool for scholars to share, enhance, validate, and expand their engagement and interaction within the academic community (Veletsianos, 2016). Twitter is one of the most actively used social media platforms by researchers for microblogging and interactions, especially among economists and social scientists (Sugimoto et al., 2017). Although Klar et al. (2020) find a strong correlation between promoting research on Twitter and citations received by that research, Tonia et al. (2016) find no effect of social media exposure on citations using a randomized trial with health science publications.

We investigate the causal effect of Twitter activity on academic citations by analyzing Twitter engagement around a substantial collection of VoxEU columns which we cross-reference with corresponding journal publications and citations. VoxEU is a notable online platform which enjoys significant recognition among academic economists and allows them to write columns about their recent research findings. To establish causality, we implement an instrumental variable strategy that capitalizes on

the timing of the VoxEU column publication. We find that the existence of at least one tweet, as opposed to none, leads to a 16 – 25% increase in citations; doubling the overall Twitter engagement generates a 6 – 16% increase in citations.

2. Data and descriptive findings

Many VoxEU columns are based on recent academic research and freshly minted working papers in economics. We complement the extensive dataset of Chan et al. (2020) consisting of author and content characteristics of 6,086 VoxEU columns from 2008 to 2017 and Twitter activity about these columns with peer-reviewed journal publication and citation data from Web of Science database (WoS). We stop our coverage of VoxEU columns at the end of 2017 to allow associated WoS publications to accumulate citations. Since there is no explicit information linking journal articles to VoxEU columns, we implement a search and matching procedure that takes into account the metadata and titles. This process matches 2,731 of 6,086 VoxEU columns to peer-reviewed publications in WoS. We find no uniform time lag between publication dates of VoxEU columns and their associated journal publications.

We estimate the following linear probability model for the likelihood of a VoxEU column to be matched with a peer-reviewed

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Table 1
Twitter activity, peer-reviewed journal publications, and citations.

	(1) Published?	(2) Cites	(3) Published?	(4) Cites	(5) Published?	(6) Cites
Any Tweet/Retweet?	0.022 [0.019]	0.102 ^b [0.050]				
Total Tweets/Retweets			-0.001 [0.008]	0.036 ^c [0.020]		
Other Engagement					-0.001 [0.009]	0.042 ^c [0.025]
Observations	6086	2279	6086	2279	6086	2279
R ²	0.059	0.475	0.059	0.474	0.059	0.474
F	7.886	47.584	7.809	47.518	7.810	47.451

Standard errors in brackets. ^c $p < 0.10$, ^b $p < 0.05$, ^a $p < 0.01$.

journal publication:

$$Publication_i = \alpha X_i + \beta(Twitter\ Activity_i) + \epsilon_i \tag{1}$$

where $Publication_i$ is one if the VoxEU column i could be matched to a peer-reviewed journal publication in WoS and zero otherwise. X_i is a vector of controls containing characteristics of the author team (whether there is an Econometric Society fellow or female author on the team, highest rank PhD institution, highest rank affiliation among authors, number of total citations to date by authors), characteristics of the VoxEU column i (topic, numbers of tables and figures, title length, overall word count, publication time) and Twitter engagement about this column by its authors, VoxEU’s official account, and VoxEU editors (*Richard Baldwin* and *Romesh Vaitilingam*). The error term is represented by ϵ_i .

We capture $Twitter\ Activity_i$ using three measures: *any tweet/retweet*, *total tweets/retweets*, and *other engagement*. We refer to any Twitter account other than VoxEU’s official account, VoxEU editors’ accounts and accounts of a respective column’s authors as *user account* or simply *user*. *Any tweet/retweet* is a binary variable that is one if any user tweeted or retweeted at least once about the column, and zero otherwise. *Total tweets/retweets* is the logarithm of the total number of users’ tweets and retweets; *other engagement* is the logarithm of the number of likes and replies by users. We observe 30,841 Twitter interactions for 4,653 VoxEU columns. 2,623 columns received an interaction from users. 12,243 Twitter interactions about 2,905 columns were registered on the same day that columns went online on *voxeu.org*.¹ The average number of users’ tweets and retweets of a VoxEU column is 5.1, the average number of likes and replies is 2.5, the median for both is zero. Columns (1), (3), and (5) in **Table 1** show estimated coefficients for Eq. (1). Twitter activity is an insignificant predictor of an associated peer-reviewed publication about a VoxEU column.

When matching VoxEU columns to WoS, we find 2,731 publications, with 452 predating their associated VoxEU columns. We exclude these to ensure that a VoxEU column was online at least one calendar year before its associated journal publication. We regress the number of total citations of matched peer-reviewed publications on their corresponding VoxEU column’s Twitter activity using the following specification:

$$E(Citations_i | Publication_i = 1) = \gamma X_i + \phi T_i + \delta(Twitter\ Activity_i) + \zeta_i \tag{2}$$

¹ Of 2,279 VoxEU columns that could be merged into the WoS, 1,595 have at least one Twitter interaction, and 1,110 of them received these interactions on the same day that they went online.

where $Citations_i$ are expressed in logarithm, T_i is a control vector containing year of WoS publication and the number of years between VoxEU column and its associated WoS publication. The error term is represented by ζ_i . The average number of citations is 23.6, with a median of 8. Columns (2), (4), and (6) in **Table 1** reveal a positive and statistically significant relation between Twitter activity associated with a VoxEU column and citations accumulated by the corresponding WoS publication.

3. Identification and results

We employ an instrumental variable (IV) strategy where we use VoxEU columns’ publication day of the week, season of the year, and their interaction as instruments. One can expect that the appearance of a VoxEU column on a weekend may affect user engagement on Twitter. Users may be eager to share or comment on VoxEU columns on Twitter during weekends, or alternatively, find weekdays more convenient. Exclusion restriction is that there is no reason why this timing should affect citations received by the corresponding journal publication, which is published no earlier than the next calendar year, through any other channel than the very Twitter activity itself. It is important for identification that there is no selection of VoxEU columns into weekend: We find no correlation between having a column published on a weekend and authors’ age or publication record. Frequent VoxEU authors are significantly less likely to get published on weekend, yet they are not relevant to our analysis, because these authors’ columns are also significantly less likely to have an associated peer-reviewed publication as these are mainly opinion columns. The same reasoning applies to seasons: Summer columns may either draw more Twitter engagement due to users’ leisure time or less due to reduced academic activity, yet there is no reason why this should affect citations either. It is also possible that non-Twitter users read VoxEU columns at similar times as Twitter users and then remember to cite the corresponding research. Nevertheless, we find no correlation between timing of the VoxEU column and citations of the corresponding research paper hence our exclusion restriction still holds.

We estimate

$$Twitter\ Activity_i^{IV} = f(Weekend_i, Summer_i, WeekendXSummer_i; X_i, T_i) \tag{3}$$

in the first stage where X_i and T_i are defined as in Eqs. (1) and (2). We regress the total number of citations on the instrumented Twitter activity, X_i , and T_i in the second stage. X_i contains Twitter engagement by column’s authors, VoxEU platform, and its editors

Table 2
Citations and Twitter activity – based on two-day-weekend instrument.

Dep.Var : Cites	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV
Any Tweet/Retweet?	0.139 ^b [0.0670]	0.163 ^c [0.0956]				
Total Tweets/Retweets			0.0565 ^b [0.0269]	0.0602 [0.0372]		
Other Engagement					0.0585 ^c [0.0343]	0.0803 [0.0542]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1252	1252	1252	1252	1252	1252
F	27.14	27.02	27.04	26.99	27.07	26.99
Kleibergen – Paap		3.00e–78		6.40e–81		1.79e–60
Cragg – Donald F		78.14		105.7		59.43
Hansen's J		0.957		0.946		0.927

Standard errors in brackets. ^c $p < 0.10$, ^b $p < 0.05$, ^a $p < 0.01$.

Table 3
Citations and Twitter activity – based on one-day-weekend instrument.

Dep.Var : Cites	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV
Any Tweet/Retweet?	0.170 ^c [0.0903]	0.245 ^c [0.134]				
Total Tweets/Retweets			0.0791 ^b [0.0373]	0.111 ^b [0.0521]		
Other Engagement					0.0922 ^c [0.0483]	0.162 ^b [0.0750]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	666	666	666	666	666	666
F	14.52	14.44	14.43	14.48	14.41	14.52
Kleibergen – Paap		1.16e–36		5.18e–37		1.27e–29
Cragg – Donald F		35.16		47.30		29.73
Hansen's J		0.835		0.897		0.901

Standard errors in brackets. ^c $p < 0.10$, ^b $p < 0.05$, ^a $p < 0.01$.

so that we control for self-promotion of authors and the VoxEU as this may proxy other characteristics that affect citations.²

We restrict weekdays to Monday and Friday for a balanced number of adjacent weekends and weekdays. Technical delays could shift column publishing to the next day, so a Friday column could appear on Saturday or a planned Sunday column on Monday. Table 2 shows OLS and IV coefficient estimates for three alternative Twitter activity measures. Although IV coefficients for the total number of tweets/retweets and for the total engagement of users have p-values over 10%, coefficients' point estimates exceed their standard errors. Existence of at least one tweet increases citations by 16% compared to when there is no tweet at all. Doubling the number of tweets/retweets and likes/replies leads to 6% and 8% more citations, respectively.

A rather low number of Sunday VoxEU columns, however, results in a weekend-light and weekday-heavy sample, according to our initial definition of weekends. In Table 3, we document OLS and IV estimations where weekend is defined as Saturday and we take Monday as the weekday. We obtain positive and

statistically significant OLS as well as IV coefficients for all three definitions of Twitter activity. Existence of at least one tweet leads to a 25% increase in citations. Doubling the number of tweets/retweets and likes/replies leads to a 11% and 16% increase, respectively.

IV coefficients are larger than their OLS counterparts in this case. This is likely due to the higher local average treatment effects resulting from the restrictive definition of weekend that we use in Table 3. Since most of the Twitter activity about a VoxEU column happens on its publication day on *voxeu.org*, one can argue that users who read and tweet about a VoxEU column on a Monday are more likely to cite it eventually compared to those who read it on a Saturday. It is also possible that those who interact with a VoxEU column on Twitter on a Monday do so for specific research purposes. Either way, the IV may be picking up on this selection so that IV coefficients are larger than the OLS coefficients in Table 3. Under and over-identification as well as weak identification tests reveal plausible results for both sets of IVs employed in Tables 2 and 3. Corresponding first stage estimations for both definitions of weekend are reported in Table 4. Coefficients of *Weekend* and *WeekendXSummer* have larger point estimates than their standard errors. Since early years of our data contain early diffusion of Twitter, it is important to

² For instance, an author who promotes their own VoxEU column on Twitter may also be doing a good job in promoting their research in general.

Table 4
First stage estimations.

	(1)	(2)	(3)	(4)	(5)	(6)
	Weekend is Sat. & Sun.			Weekend is Saturday		
	Any Tw.	Total Tw.	Other Eng.	Any Tw.	Total Tw.	Other Eng.
Weekend	−0.0335 [0.0233]	−0.104 ^b [0.0518]	−0.0571 [0.0458]	−0.0693 ^b [0.0344]	−0.136 ^c [0.0766]	−0.0750 [0.0659]
Summer	0.00245 [0.0332]	−0.0447 [0.0722]	−0.00999 [0.0662]	0.0459 [0.0493]	0.0464 [0.103]	0.0692 [0.0886]
WeekendXSummer	0.0725 [0.0455]	0.253 ^b [0.104]	0.219 ^b [0.0986]	0.0670 [0.0649]	0.171 [0.146]	0.0872 [0.128]
2nd St.Cont.&FES	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1252	1252	1252	666	666	666
R ²	0.578	0.649	0.533	0.556	0.635	0.551
F	95.51	43.90	18.54	47.31	26.43	12.24

Standard errors in brackets. ^c $p < 0.10$, ^b $p < 0.05$, ^a $p < 0.01$.

include time controls for VoxEU columns' online appearance. The three instruments with time trend turn out jointly significant in all specifications of the first stage.

4. Conclusion

We investigate whether Twitter activity has an impact on citations of published research and we deliver causal evidence for it. We find that the existence of at least one tweet, as opposed to none, leads to a 16 – 25% increase in citations. Doubling the overall Twitter engagement generates up to 16% more citations. Thus, Twitter and possibly other wide-spread social media platforms (depending on the discipline) are important for broader scientific community outreach. An important policy implication is that researchers as well as academic institutions should not be shy to showcase their research on social media.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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