

Online Social Network Structure and Offline Protests

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Motivation

- Social ties are important for people to get involved in collective actions.
 - Marwell (1988); Gould (1993); Diani (2013); Porta and Mattoni (2016).
- Recent research has recognized the link between online social network and offline protests, basically based on social media data, i.e, twitter and facebook.
 - Coppock, Guess and Ternovski (2016); Bahrami et al. (2018); Anduiza et al. (2014), Steinert-Threlkeld et.al (2015) among many others.
- However, on the pattern of offline-online relationship.
 - Less clustered online social network leads to more protests (Barbara 2015, Steinert-Threlkeld 2017).
 - More clustered online social network leads to more protests (Chwe 2000).

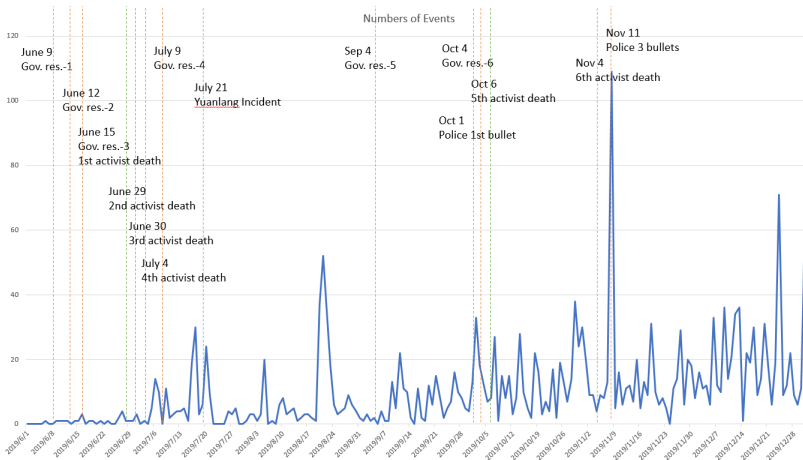
Research Question

- What kind of online social network structure is more likely to lead to (more) offline protests?
- Existing literature has mostly relied on a particular type of online platform, and namely social media. What about other type of online platform, i.e., a BBS mobilization website?

Empirical Case

- The Anti-Extradition Law Amendment Bill movements in Hong Kong in 2019-2020.
- A radical and sustained social movement lasting for more than half a year from early June of 2019 to first several months of 2020.
- A local BBS website, lihkg, acts as the main mobilization “organization” of the series protests.

Number of Events Per Day



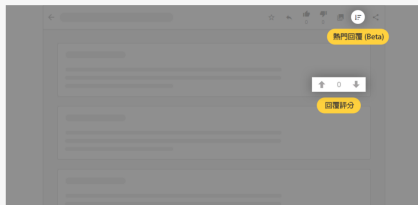
Screenshot of LIHKG Forum

☺ 吹水台 🔁 +

最新 熱門

- ⚡ 啫啫滑雞煲 剛剛 🗣️ 5 2 頁 - 時事台
荃灣男子情困墮樓亡
- ⚡ 27540 剛剛 🗣️ 99 3 頁 - 時事台
曹永廉心腎腎警號 通波仔救命
- ⚡ 粉紅小薯仔 1 分鐘前 🗣️ 3760 12 頁 - 創意台
最近做FYP，由零開始整武裝 MK妹Figure
- ⚡ 1333 剛剛 🗣️ -437 12 頁 - 影視台
認真問 花姐error遊好笑咩？
- ⚡ 會員271829 剛剛 🗣️ 469 13 頁 - 時事台
港鐵查票員針對年輕情侶站內爆粗 發惡兼票控「一定搞到你哋」
- ⚡ 慘過番印度 8 分鐘前 🗣️ -17 2 頁 - 娛樂台
最近睇「所以我和黑粉結婚了」，幾好睇

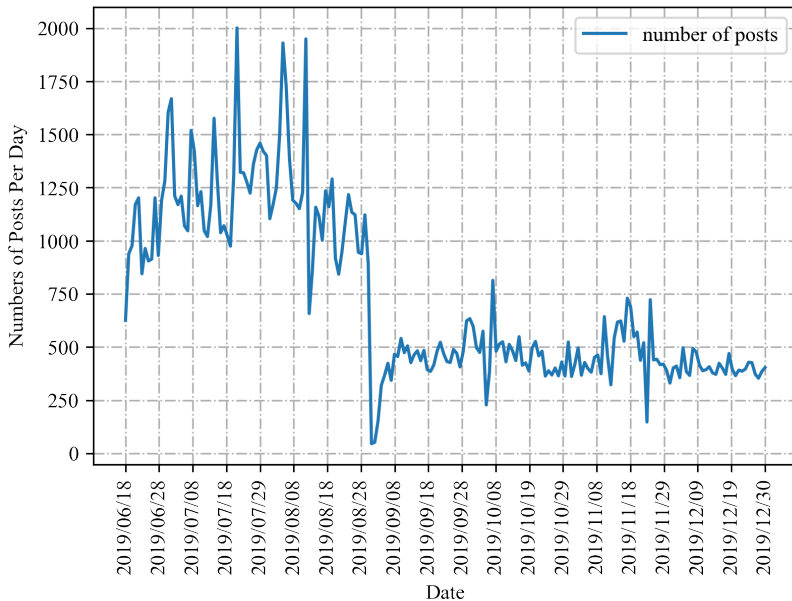
☺ LIHKG 討論區



手機用戶可以下載官方 LIHKG 應用程式

[iOS 應用程式](#) [Android 應用程式](#)

Number of Posts Per Day



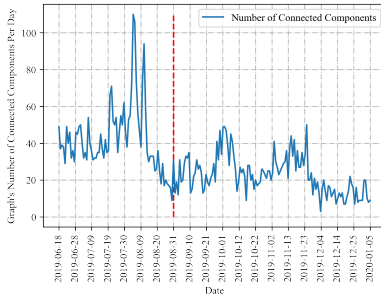
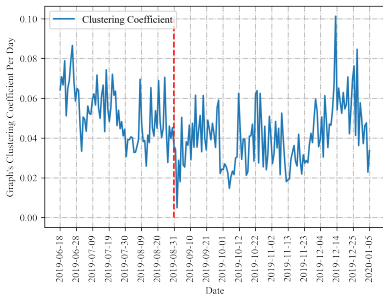
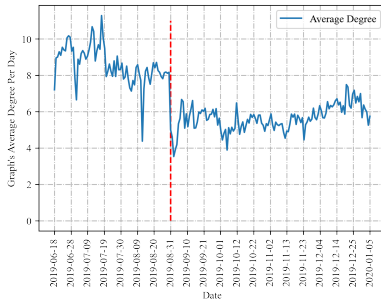
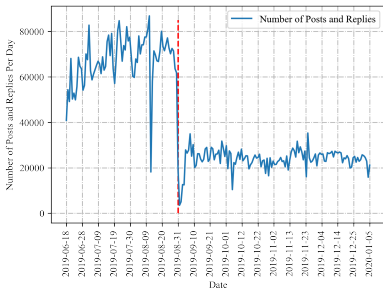
Research Data

- We downloaded historical data of 1 June 2019 to early June 2020 from *LIHKG*, including more than 13 millions posts and replies from more than 175 thousands unique ID registered on this website.
- We use Python's NetworkX library to calculate daily social network structure of *LIHKG*. Key indicators include:
 - **Average degree** measuring the average activity of all online active users on a platform.
 - **Clustering coefficient** measuring the level of clustering within the social networks of the platform.
 - **Number of connected components** measuring the number of separated online communities on a platform.

Sample Data

mediaTy	title	url	content	date	from	in	by	words	comments	isTopic	poster	
0	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://1ihkg.com/thread/1496672	2019-08-23	LIHKG	討論區	政事台	低端黑地	0	0	FALSE	李靜儀BB
1	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://支持你地	2019-08-23	LIHKG	討論區	政事台	轉個視	4	0	FALSE	李靜儀BB
2	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://push	2019-08-23	LIHKG	討論區	政事台	香港溫家	4	0	FALSE	李靜儀BB
3	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://支持國泰 太古	2019-08-23	LIHKG	討論區	政事台	大金鐘	7	0	FALSE	李靜儀BB
4	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://support	2019-08-23	LIHKG	討論區	政事台	漆頭	7	0	FALSE	李靜儀BB
5	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://推倒禁大陸航空公司飛	2019-08-23	LIHKG	討論區	政事台	咕哩	10	0	FALSE	李靜儀BB
6	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://咪摺轉移重心, 我地係要捍衛香港 要原就原佢	2019-08-23	LIHKG	討論區	政事台	只有一個	42	0	FALSE	李靜儀BB
7	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://一個國家擺擺到明欺壓一間公司既員工, 劍奪	2019-08-23	LIHKG	討論區	政事台	海闊夜空	128	0	FALSE	李靜儀BB
8	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://中共而家玩空城禁飛, 捱住國泰春袋迫佢跪低	2019-08-23	LIHKG	討論區	政事台	非人類基	88	0	FALSE	李靜儀BB
9	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://1ihkg.com/thread/1496672	2019-08-23	LIHKG	討論區	政事台	香港九龍	0	0	FALSE	李靜儀BB
10	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://推	2019-08-23	LIHKG	討論區	政事台	轉台喇	1	0	FALSE	李靜儀BB
11	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://True	2019-08-23	LIHKG	討論區	政事台	係咪痴	4	0	FALSE	李靜儀BB
12	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://推	2019-08-23	LIHKG	討論區	政事台	犯規見	1	0	FALSE	李靜儀BB
13	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://罷工同聲援有衝突可以幫拖但希望佢哋自己都	2019-08-23	LIHKG	討論區	政事台	柚木普	24	0	FALSE	李靜儀BB
14	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://推呀	2019-08-23	LIHKG	討論區	政事台	世一夏神	2	0	FALSE	李靜儀BB
15	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://邊句講過話唔聲援唔支持請多2個option俾佢	2019-08-23	LIHKG	討論區	政事台	一齊走	30	0	FALSE	李靜儀BB
16	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://1ihkg.com/thread/1496672	2019-08-23	LIHKG	討論區	政事台	NeverEnd	0	0	FALSE	李靜儀BB
17	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://推	2019-08-23	LIHKG	討論區	政事台	烏哩單刀	1	0	FALSE	李靜儀BB
18	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://國泰大罷工, 攞炒, 腳下但炒得幾多個	2019-08-23	LIHKG	討論區	政事台	不安?	17	0	FALSE	李靜儀BB
19	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://真 唯有集體罷工係出路	2019-08-23	LIHKG	討論區	政事台	柚木普	11	0	FALSE	李靜儀BB
20	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://推	2019-08-23	LIHKG	討論區	政事台	北絲江連	1	0	FALSE	李靜儀BB
21	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://推	2019-08-23	LIHKG	討論區	政事台	水水雞	1	0	FALSE	李靜儀BB
22	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://推	2019-08-23	LIHKG	討論區	政事台	蕃薯好可	1	0	FALSE	李靜儀BB
23	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://No Extradition bill ? 好似少咗個	2019-08-23	LIHKG	討論區	政事台	冇捱野好	28	0	FALSE	李靜儀BB
24	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://1ihkg.com/thread/1496672	2019-08-23	LIHKG	討論區	政事台	香港九龍	0	0	FALSE	李靜儀BB
25	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://1ihkg.com/thread/1496672	2019-08-23	LIHKG	討論區	政事台	校長修八	0	0	FALSE	李靜儀BB
26	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://罷工嘅等乜?	2019-08-23	LIHKG	討論區	政事台	bb jump	7	0	FALSE	李靜儀BB
27	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://推	2019-08-23	LIHKG	討論區	政事台	我是泡菜	1	0	FALSE	李靜儀BB
28	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://申請合法集會! 腳下但唔有咩咁炒你	2019-08-23	LIHKG	討論區	政事台	KAON	19	0	FALSE	李靜儀BB
29	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://成個航空界再搞罷工牙頭直指民航局咁咁咁咁	2019-08-23	LIHKG	討論區	政事台	肥窮老毒	32	0	FALSE	李靜儀BB
30	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://CEO都只係個傀儡國泰CEO都係聽命於董事局同	2019-08-23	LIHKG	討論區	政事台	松露李娜	188	0	FALSE	李靜儀BB
31	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://其實除咗大罷工 根本無野可以威脅到上面d	2019-08-23	LIHKG	討論區	政事台	絕情小絲	21	0	FALSE	李靜儀BB
32	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://721 811	2019-08-23	LIHKG	討論區	政事台	Rhook	7	0	FALSE	李靜儀BB
33	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://推	2019-08-23	LIHKG	討論區	政事台	犯規見	1	0	FALSE	李靜儀BB
34	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://如果佢入面藍多過黃, 罷工唔會有用, 炒晒罷	2019-08-23	LIHKG	討論區	政事台	hk3	94	0	FALSE	李靜儀BB
35	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://如果佢入面藍多過黃, 罷工唔會有用, 炒晒罷	2019-08-23	LIHKG	討論區	政事台	hk3	94	0	FALSE	李靜儀BB
36	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://如果佢入面藍多過黃, 罷工唔會有用, 炒晒罷	2019-08-23	LIHKG	討論區	政事台	hk3	94	0	FALSE	李靜儀BB
37	forum	是咁的, 我哋一班國泰同港龍嘅空中服務員想做嘢嘢	https://good	2019-08-23	LIHKG	討論區	政事台	我也明白	4	0	FALSE	李靜儀BB

End of August as a SHOCK



End of August as a SHOCK

緊急後備討論方式

2019年8月31日起 連登間斷受大型 DDoS 攻擊
如連登Server Down 建議採用緊急討論方式

使用Twitter Hashtag功能 於Tweet加上

#LIHKG

實時情報相關資訊 可加入日期Hashtag

示範

1715 警方立法會外向記者噴椒
#LIHKG #831HK



LIHKG 討論區



我不是機器人



reCAPTCHA
隱私權 · 修改

進入

Who Left After the Shock?

```
60 2019-08-17 06:00:00 [42100, 93619, 16583, 78, 125, 100, 63]
61 2019-08-18 06:00:00 [41179, 93793, 17221, 110, 146, 142, 71]
62 2019-08-19 06:00:00 [40414, 94689, 17170, 75, 130, 126, 64]
63 2019-08-20 06:00:00 [39690, 94638, 17884, 98, 154, 147, 57]
64 2019-08-21 06:00:00 [39014, 96314, 16996, 76, 109, 105, 54]
65 2019-08-22 06:00:00 [38378, 97948, 15993, 69, 103, 122, 55]
66 2019-08-23 06:00:00 [37657, 97139, 17538, 58, 97, 125, 54]
67 2019-08-24 06:00:00 [36836, 97007, 18401, 93, 134, 138, 59]
68 2019-08-25 06:00:00 [36045, 98353, 17840, 60, 166, 124, 74]
69 2019-08-26 06:00:00 [35323, 99472, 17469, 44, 163, 128, 69]
70 2019-08-27 06:00:00 [34688, 100266, 17308, 53, 142, 150, 61]
71 2019-08-28 06:00:00 [34158, 101135, 17001, 38, 144, 138, 54]
72 2019-08-29 06:00:00 [33647, 103441, 15221, 45, 132, 119, 63]
73 2019-08-30 06:00:00 [33250, 104333, 14626, 63, 192, 138, 66]
74 2019-08-31 06:00:00 [33030, 111953, 7528, 29, 61, 46, 21]
75 2019-09-01 06:00:00 [32968, 118220, 1462, 2, 4, 4, 8]
76 2019-09-02 06:00:00 [32888, 116973, 2783, 7, 9, 6, 2]
77 2019-09-03 06:00:00 [32641, 113624, 6347, 10, 16, 23, 7]
78 2019-09-04 06:00:00 [32388, 114402, 5742, 27, 79, 19, 11]
79 2019-09-05 06:00:00 [31771, 110529, 10204, 31, 73, 44, 16]
80 2019-09-06 06:00:00 [31411, 111928, 9123, 33, 98, 55, 20]
81 2019-09-07 06:00:00 [31078, 113329, 8007, 63, 113, 43, 35]
82 2019-09-08 06:00:00 [30711, 111364, 10369, 57, 72, 66, 29]
83 2019-09-09 06:00:00 [30345, 112547, 9572, 63, 69, 46, 26]
84 2019-09-10 06:00:00 [29896, 112578, 9967, 65, 83, 54, 25]
85 2019-09-11 06:00:00 [29666, 115328, 7499, 33, 80, 43, 19]
86 2019-09-12 06:00:00 [29415, 116017, 7045, 19, 114, 38, 20]
87 2019-09-13 06:00:00 [29117, 115112, 8283, 16, 77, 45, 18]
88 2019-09-14 06:00:00 [28864, 115964, 7591, 62, 105, 49, 33]
89 2019-09-15 06:00:00 [28510, 114874, 9087, 50, 76, 50, 21]
```

- C1: No posts/replies ever
- C2: Earlier posts/replies but not today
- C3: No posts, but replies
- C4: posts with less than 2 replies
- C5: posts with more than 2 but less than 20 replies
- C6: posts with more than 20 replies, and the ratio of self-reply vs others-reply less than 0.2
- C7: posts with more than 20 replies, and the ratio of self-reply vs others-reply more than 0.2

After 8.31, Online leaders and activists left.

Empirical Analysis

Table 1 Statistical Description(Original Variable)

	Variables	Type	Mean(Standard Deviation)
Dependent Variable	Event Number	Continuous variable	5.78(9.46)
Independent Variable	X1: Clustering Coefficient	Continuous variable	0.05(0.01)
Independent Variable	X2: Average Degree	Continuous variable	8.59(1.02)
Independent Variable	X3: Number of Connected Components	Continuous variable	42.65(18.69)

Table 2 Statistical Description(Log Variable)

	Variables	Type	Mean(Standard Deviation)
Dependent Variable	Event Number	Continuous variable	0.94(1.27)
Independent Variable	X1: Clustering Coefficient	Continuous variable	-2.99(0.26)
Independent Variable	X2: Average Degree	Continuous variable	2.14(0.13)
Independent Variable	X3: Number of Connected Components	Continuous variable	3.66(0.43)

Model Setting

To explore the long-term relationship between Y and X_1, X_2, X_3 , VAR model is used to fit and VEC model is used to determine the long-term relationship between variables. The VAR(p) model is as follows,

$$\Phi(L)(Z_t - \mu - \gamma t) = \epsilon_t \quad (1)$$

where $Z_t = (Y_t, X_{1t}, X_{2t}, X_{3t})^T, \Phi(L) = I_4 - \sum_{i=1}^p \Phi_i L^i$.

And the model can be written as a CVECM (Conditional Vector Error Correction Model) model:

$$\Delta y_t = c_0 + c_1 t + \pi_{yy} y_{t-1} + \pi_{yy.x} x_{t-1} + \sum_{i=1}^{p-1} \psi_i' \Delta z_{t-i} + \omega' \Delta x_t + u_t \quad (2)$$

And the long-term relationship we want is

$$0 = c_0 + c_1 t + \pi_{yy} y_{t-1} + \pi_{yy.x} x_{t-1} \quad (3)$$

Unit Root Test

Table 3 Unit Root Test

Variable	ADF	PP	KPSS	Order of Integration
Y	< 0.01	< 0.01	< 0.01	I(0)
X1	> 0.1	> 0.1	> 0.1	I(1)
X2	> 0.1	> 0.1	> 0.1	I(1)
X3	> 0.1	> 0.1	> 0.1	I(1)

Boundary Test

Table 4 Boundary Test

	No time trend	Limited time trend	Unlimited time trend
p value (F-Test)	0	0	0.02
p value (t-test)	0	\	0.016

Consider the F-test and the t-test in three cases: no time trend, limited time trend, and unlimited time trend (Table 4). When significance level is 0.05, we can conclude that there is a significant long-term relationship between Y and X_1 , X_2 , X_3 .

Regression Results (I)

No Time Trend:

$$Y_t = \mu_Y + \sum_{i=1}^2 \beta_{1i} Y_{t-i} + \sum_{i=0}^8 \beta_2 X_{1t} + \sum_{i=0}^2 \beta_{3i} X_{2t-i} + \sum_{i=0}^1 \beta_{4i} X_{3t} + \epsilon_t \quad (4)$$

where $\mu_Y = -17.9$, $\beta_1 = (0.18, -0.09)$,

$\beta_2 = (-0.68, 0.09, -0.61, -0.41, -0.02, -0.51, 0.88, -1.38, -1.06)$,

$\beta_3 = (1.16, 2.19, 2.18)$, $\beta_4 = (-0.19, -0.90)$;

With Time Trend:

$$Y_t = \mu_Y + \sum_{i=1}^6 \beta_{1i} Y_{t-i} + \sum_{i=0}^8 \beta_2 X_{1t} + \sum_{i=0}^1 \beta_{3i} X_{2t-i} + \sum_{i=0}^3 \beta_{4i} X_{3t} + \beta_5 t + \epsilon_t \quad (5)$$

where $\mu_Y = -14.57$, $\beta_1 = (0.21, -0.14, -0.15, 0.06, 0.02, -0.17)$,

$\beta_2 = (-0.44, -0.02, -0.17, -0.30, 0.27, -0.58, 0.91, -1.15, -0.93)$,

$\beta_3 = (2.85, 2.74)$, $\beta_4 = (0.10, -0.87, 1.03, -1.37)$, $\beta_5 = 0.02$.

Regression Results (II)

Long term relationship between the number of collective action events and its influencing factors (NOT including time trend):

$$y_t = -19.66 - 4.07X_{1t} + 6.07X_{2t} - 1.19X_{3t} \quad (6)$$

Long term relationship between the number of collective action events and its influencing factors (including time trend):

$$y_t = -12.46 - 2.06X_{1t} + 4.78X_{2t} - 0.94X_{3t} + 0.016t \quad (7)$$

	Variables	Type	Mean(Standard Deviation)
Dependent Variable	Event Number	Continuous variable	0.94(1.27)
Independent Variable	X1: Clustering Coefficient	Continuous variable	-2.99(0.26)
Independent Variable	X2: Average Degree	Continuous variable	2.14(0.13)
Independent Variable	X3: Number of Connected Components	Continuous variable	3.66(0.43)

Preliminary Findings and Discussions

- Online social network structure measured by average degree has long-run positive relationship with offline protests.
- For online platform such as a BBS forum, more clustered online social network structure is more likely to lead to less offline protests.
- This finding is in line with mainstream doctrine, although LIHKG and Twitter and Facebook are different attributes of online mobilization platform.

Limitations

- Only use a a very few part of information of the whole data.
- Need more data collecting and cleaning work.
- Not all posts and replies should have same weight.
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Thanks