

Dear all,

Currently I am running a OLS Difference and Difference regression on Nigerian DHS data (2008 and 2018) and am trying to estimate the effect of terror (Boko Haram in this case) on childmarriage and teenage childbirth/pregnancy. In this regard I also want to estimate the effect on age at childmarriage and age at teenage childbirth/pregnancy for the women who did actually face these circumstances.

My questions are: How would you judge the effects on attacknumber and attacknumber*BH in both the cases 1) age at childmarriage and 2) age at teenage childbirth. From my understanding this would mean an additional attack in a non-BH area raises the age at childmarriage by +0.06years and the age at teenage childbirth by +0.07 years. If we now look at the interaction effects we see that these are pretty much the same amount but with the opposite sign (negative) (-0.06 years/-0.07 years). I would interpret it in this way, that the overall effect of an attack on a BH affected states is essentially zero as the two coefficients cancel out ($\beta_1 + \beta_3 = 0$) so the age stays the same with an increase in one attack. In non-BH states however an additional attack increases the age ($\beta_1 > 0$). Would this be the correct interpretation?

Another question would be: Why do my models omit the state Kaduna? One state is already omitted (Sokoto) as the baseline surveystate. Nonetheless, all my estimations omit Kaduna as well. Note: Kaduna is part of the BH coded group(surveystates: Borno, Yobe, Adamawa, Kano, Gombe, Bauchi, Kauna then BH=1). So could this be due to some colinearity etc? I checked and all observations and values for Kaduna are correctly coded as for all other states which do not seem to present this "omitted" issue.

Thank you very much in advance for any help!
Greetings

Running my final model using the following commands I get these results:

```
svy: reg agefirstunionCM i.BH c.attacknumberCM c.attacknumberCM#i.BH i.muslim i.urban  
i.kanuri i.hhheadmale i.literacy i.wealthindex i.edulevel c.eduyears i.edulevelpartner  
c.eduyearspartner i.largefamily i.polygamoushh i.surveystate  
Survey: Linear regression
```

Number of strata	=	146	Number of obs	=	7,825
Number of PSUs	=	1,640	Population size	=	7,693,726,278
Design df	=	1,494			
F(53, 1442)	=	10.67			
Prob > F	=	0.0000			
R-squared	=	0.0935			

Linearized						
agefirstunionCM	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	

1.BH	.2678601	.1535981	1.74	0.081	-.0334307	.5691509
attacknumberCM	.0606883	.0080648	7.53	0.000	.0448688	.0765078
BH#c.attacknumberCM						
1	-.0597985	.008065	-7.41	0.000	-.0756184	-.0439785
1.muslim	-.1875304	.1036764	-1.81	0.071	-.3908971	.0158363
1.urban	-.0253483	.067249	-0.38	0.706	-.1572608	.1065642
1.kanuri	-.093941	.1311277	-0.72	0.474	-.3511549	.163273
1.hhheadmale	-.0833878	.0745814	-1.12	0.264	-.2296831	.0629076
1.literacy	.0773257	.0785068	0.98	0.325	-.0766695	.2313209
wealthindex						
poorer	.0855394	.0556279	1.54	0.124	-.0235776	.1946564
middle	.1246874	.0750185	1.66	0.097	-.0224653	.2718401
richer	.2579857	.0921339	2.80	0.005	.0772601	.4387113
richest	.302223	.1318766	2.29	0.022	.0435401	.5609059
1.edulevel	.0766587	.1100335	0.70	0.486	-.1391778	.2924952
eduyears	.0187935	.0120535	1.56	0.119	-.00485	.042437
1.edulevelpartner	-.1190187	.1186531	-1.00	0.316	-.3517631	.1137257
eduyearspartner	.0193016	.0103064	1.87	0.061	-.0009149	.0395181
1.largefamily	.0050871	.0386496	0.13	0.895	-.0707262	.0809003
1.polygamoushh	-.1149114	.0461247	-2.49	0.013	-.2053874	-.0244355
surveystate						
zamfara	-.1567509	.1577283	-0.99	0.320	-.4661433	.1526415
katsina	-.058353	.1397715	-0.42	0.676	-.3325222	.2158162
jigawa	.6201046	.1272395	4.87	0.000	.3705176	.8696916
yobe	-.0515254	.1592621	-0.32	0.746	-.3639265	.2608758
borno	-.7478194	.205227	-3.64	0.000	-1.150383	-.3452558
adamawa	.2552234	.1539995	1.66	0.098	-.0468549	.5573016
gombe	.1744793	.1335148	1.31	0.191	-.0874171	.4363757
bauchi	-.0511485	.1345675	-0.38	0.704	-.3151098	.2128128
kano	-.0184404	.1325222	-0.14	0.889	-.2783897	.2415089
kaduna	0 (omitted)					
kebbi	.5643663	.1536166	3.67	0.000	.2630391	.8656934
niger	.32048	.1612237	1.99	0.047	.0042311	.6367289
abuja	-.3547092	.2775083	-1.28	0.201	-.8990565	.1896382
nasarawa	.4572007	.1733962	2.64	0.008	.1170748	.7973266
plateau	-.065136	.2224453	-0.29	0.770	-.5014744	.3712023
taraba	.5864252	.1233278	4.76	0.000	.3445111	.8283393
benue	.5949883	.1740201	3.42	0.001	.2536386	.9363379
kogi	.1937181	.1784986	1.09	0.278	-.1564164	.5438526

kwara		.7585649	.2532547	3.00	0.003	.2617923	1.255338
oyo		.9811194	.1860203	5.27	0.000	.6162307	1.346008
osun		.8110708	.2348476	3.45	0.001	.3504048	1.271737
ekiti		.9938482	.2102819	4.73	0.000	.581369	1.406327
ondo		1.057972	.2461233	4.30	0.000	.5751884	1.540756
edo		.5724927	.3749659	1.53	0.127	-.1630229	1.308008
anambra		.5366899	.2776328	1.93	0.053	-.0079017	1.081281
enugu		.0549801	.3721721	0.15	0.883	-.6750553	.7850155
ebonyi		.6244667	.2307461	2.71	0.007	.171846	1.077087
cross river		.1285754	.3151316	0.41	0.683	-.489572	.7467227
akwa ibom		.6034849	.2663215	2.27	0.024	.0810811	1.125889
abia		.3807716	.2884868	1.32	0.187	-.1851106	.9466537
imo		.795596	.2736021	2.91	0.004	.2589111	1.332281
rivers		.3901126	.3199313	1.22	0.223	-.2374497	1.017675
bayelsa		.2268694	.2062523	1.10	0.272	-.1777054	.6314442
delta		.4423073	.2656391	1.67	0.096	-.078758	.9633726
lagos		.1382112	.4069651	0.34	0.734	-.6600724	.9364948
ogun		.7265004	.2636357	2.76	0.006	.2093649	1.243636
_cons		14.4783	.1604158	90.25	0.000	14.16363	14.79296

Note: Strata with single sampling unit centered at overall mean.

svy: reg agefirstbirthpregTP c.attacknumberTP i.BH c.attacknumberTP#i.BH i.muslim i.urban
i.kanuri i.hhheadmale i.literacy i.wealthindex i.edulevel c.eduyears i.edulevelpartner
c.eduyearspartner i.largefamily i.polygamoushh i.surveystate
Survey: Linear regression

Number of strata	=	148	Number of obs	=	9,375
Number of PSUs	=	1,892	Population size	=	9,144,835,358
		Design df	=	1,744	
		F(53, 1692)	=	12.96	
		Prob > F	=	0.0000	
		R-squared	=	0.0901	

		Linearized					
agefirstbirthpregTP		Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
-----+							
attacknumberTP		.071027	.006938	10.24	0.000	.0574193	.0846346
1.BH		-.1112492	.126494	-0.88	0.379	-.3593451	.1368466
BH#c.attacknumberTP							
1		-.0699279	.0069386	-10.08	0.000	-.0835368	-.0563191
1.muslim		-.0973278	.0873922	-1.11	0.266	-.2687322	.0740766

1.urban	.0955667	.0632548	1.51	0.131	-.0284964	.2196298
1.kanuri	-.1299689	.1442185	-0.90	0.368	-.4128283	.1528905
1.hhheadmale	-.0782056	.0865481	-0.90	0.366	-.2479547	.0915434
1.literacy	.151714	.0776939	1.95	0.051	-.0006691	.3040971
wealthindex						
poorer	.060747	.05595	1.09	0.278	-.0489892	.1704831
middle	-.0071219	.0685636	-0.10	0.917	-.1415974	.1273536
richer	.0532612	.0824339	0.65	0.518	-.1084185	.2149409
richest	.010767	.113259	0.10	0.924	-.2113707	.2329047
1.edulevel	.1963236	.104823	1.87	0.061	-.0092684	.4019156
edueyears	.0174825	.0112269	1.56	0.120	-.0045371	.0395021
1.edulevelpartner	-.1930564	.1015509	-1.90	0.057	-.3922308	.006118
edueyearspartner	.0318046	.009385	3.39	0.001	.0133975	.0502117
1.largefamily	.0303519	.0405891	0.75	0.455	-.0492565	.1099602
1.polygamoushh	-.1620505	.0458664	-3.53	0.000	-.2520094	-.0720917
surveystate						
zamfara	.0858908	.1330291	0.65	0.519	-.1750224	.3468041
katsina	-.5840868	.1207941	-4.84	0.000	-.8210034	-.3471702
jigawa	.2658763	.1246078	2.13	0.033	.0214798	.5102728
yobe	-.0821049	.1665512	-0.49	0.622	-.408766	.2445562
borno	-.8917408	.213171	-4.18	0.000	-1.309838	-.4736431
adamawa	.3680567	.139635	2.64	0.008	.0941872	.6419263
gombe	.2724548	.1226303	2.22	0.026	.0319369	.5129728
bauchi	.072955	.124723	0.58	0.559	-.1716674	.3175773
kano	.2036385	.1214449	1.68	0.094	-.0345544	.4418315
kaduna	0 (omitted)					
kebbi	.1575467	.1378783	1.14	0.253	-.1128773	.4279708
niger	-.2972779	.1404352	-2.12	0.034	-.5727169	-.0218389
abuja	-.6414893	.2574665	-2.49	0.013	-1.146465	-.1365138
nasarawa	.0675104	.1564192	0.43	0.666	-.2392784	.3742992
plateau	-.6286565	.2015918	-3.12	0.002	-1.024044	-.2332694
taraba	.0477431	.1239716	0.39	0.700	-.1954055	.2908918
benue	.0530447	.1622574	0.33	0.744	-.2651948	.3712841
kogi	-.6367253	.1727088	-3.69	0.000	-.9754634	-.2979871
kwara	.3226968	.1683973	1.92	0.055	-.007585	.6529785
oyo	.5029193	.1618882	3.11	0.002	.1854039	.8204346
osun	.3371306	.1697553	1.99	0.047	.0041854	.6700759
ekiti	.242641	.2130414	1.14	0.255	-.1752024	.6604844
ondo	.0348621	.2134846	0.16	0.870	-.3838506	.4535748
edo	.3004096	.2602866	1.15	0.249	-.210097	.8109162
anambra	.0860519	.2592354	0.33	0.740	-.4223929	.5944968
enugu	-.2526511	.2600984	-0.97	0.332	-.7627886	.2574864
ebonyi	-.0645027	.2070343	-0.31	0.755	-.4705643	.3415589
cross river	.0781527	.2246077	0.35	0.728	-.3623761	.5186815
akwa ibom	-.2286795	.2535716	-0.90	0.367	-.7260158	.2686568

abia		.6430127	.2656633	2.42	0.016	.1219606	1.164065
imo		.2211599	.2873089	0.77	0.442	-.3423463	.7846662
rivers		-.3946292	.2624022	-1.50	0.133	-.9092852	.1200268
bayelsa		-.4284522	.1931851	-2.22	0.027	-.807351	-.0495534
delta		-.0722554	.2312345	-0.31	0.755	-.5257815	.3812707
lagos		.409688	.2699203	1.52	0.129	-.1197135	.9390894
ogun		.2558986	.1929527	1.33	0.185	-.1225443	.6343416
_cons		16.46443	.152316	108.09	0.000	16.16569	16.76317

Note: Strata with single sampling unit centered at overall mean.

Subject: Re: Diff in Diff OLS Estimation and Interpretation

Posted by [Liz-DHS](#) on Fri, 29 May 2020 14:39:30 GMT

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Dear User, a response from Dr. Tom Pullum:

Quote:

I would say much the same thing. The effect of an additional attack in a non-BH area is .061 (or .071). The effect of an additional attack in a BH area is effectively zero. However, in a BH area the coefficient of .268 (or -.111) cannot be ignored. For the first outcome, the effect of BH is equivalent to $.268/.061 = 4.4$ attacks in a non-BH area. However, and this is important, the coefficient of BH is not statistically significant. For the second outcome, it's harder to interpret--the effect of a BH area is equivalent to $-.111/.071 = -1.6$ attacks in a non-BH area. But that coefficient of BH also is not significant, so it's not a good idea to try to interpret it.

You have taken the first state in the entire list of states, Sokoto, as the reference state.

Apparently the coefficient for Kaduna is so close to that of Sokoto that Stata has in effect grouped Kaduna with Sokoto, by giving it a coefficient of 0.

You might consider restricting to the northern zones of Nigeria, because I believe most of the states have no Boko Haram and no attacks. However, you know more about the context than I do!

Subject: Re: Diff in Diff OLS Estimation and Interpretation

Posted by [Goethe2014](#) on Fri, 29 May 2020 15:25:55 GMT

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Dear Tom,

Thank you very much for the reassuring answer.

Regarding the omitted Kaduna state dummy. Is there anything I can do to change that? Kaduna is part of my BH treatment group (BH=1) while Sokoto is not (BH=0) so if Stata groups them this would work against the overall specification of my treatment groups somehow - I hope this makes sense.

With regard to the northeastern region you mean that instead of comparing the affected states to the non/less-affected states in Nigeria I run an usual OLS regression on the BH affected states only - so make use of the attacknumber as a typical continuous independent variable similar to education years and only analyze the effects of an additional attack on my dependent variables in the conflict region?

Thank you very much in advance.

Greetings

Caspar
