Using Difference-in-Differences Analysis and the Kocyk Geometric Lag Model to Estimate Aspects of Carbon Tax Effectiveness in Nordic Countries

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Combined DID w/ Year Dummies

C02Emissions	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
y90taxed	-1.11	.365	-3.04	.003	-1.832	-.389	***
Taxed	-1.461	.376	-3.88	0	-2.205	-.716	***
Coal	11.168	1.541	7.25	0	8.122	14.215	***
Gas	14.256	2.442	5.84	0	9.426	19.085	***
Hydro	-5.286	.649	-8.14	0	-6.569	-4.002	***
Nuclear	-1.351	.604	-2.24	.027	-2.545	-.157	**
Wind	-40.826	5.454	-7.49	0	-51.611	-30.04	***
Oil	4.925	.453	10.86	0	4.028	5.821	***
Biofuelstwh	.225	.04	5.66	0	.147	.304	***
Constant	8.567	.701	12.22	0	7.181	9.954	***

Mean dependent var	8.766	SD dependent var	2.207
R-squared	0.949	Number of obs	196.000
F-test	41.808	Prob > F	0.000

*** p<.01, ** p<.05, * p<.1

Combined Koyck Model w/ Year Dummies

C02Emissions	Coef.	Std.Err.	z	P>z	[95%Conf.	Interval]
C02Emissions						
C02Emissions						
L1.	0.338	0.027	12.630	0.000	0.285	0.390
CarbonTaxRate	0.010	0.008	1.280	0.199	-0.006	0.026
Coal	16.156	1.332	12.130	0.000	13.546	18.766
Gas	17.738	2.143	8.280	0.000	13.537	21.939
Hydro	-0.777	0.363	-2.140	0.032	-1.488	-0.065
Solar	-81.895	5.151	-15.900	0.000	-91.991	-71.799
Wind	-32.665	5.995	-5.450	0.000	-44.414	-20.916
Oil	2.044	0.299	6.840	0.000	1.458	2.630

Control Country- Iceland

Treatment Countries- Finland, Sweden, Denmark

General Policy Implementation- 1990

Difference-in-Differences:

- Way to simulate semi-scientific experiment
- y90Taxed is the interaction term
- Taxed dummy variable applied at country level

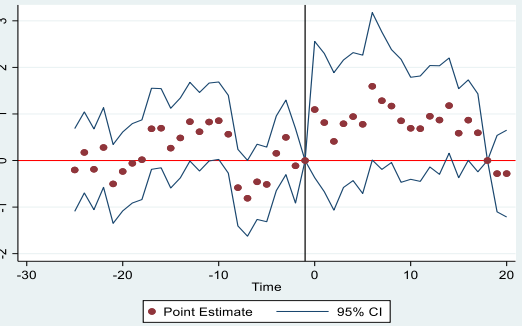
Koyck Geometric Lag:

- Are taxes losing effectiveness based on a price level rise?
- L1 is the lagged variable of interest
- Value of l needs to be 0-1
- Coefficient of .338 implies decaying rate each year

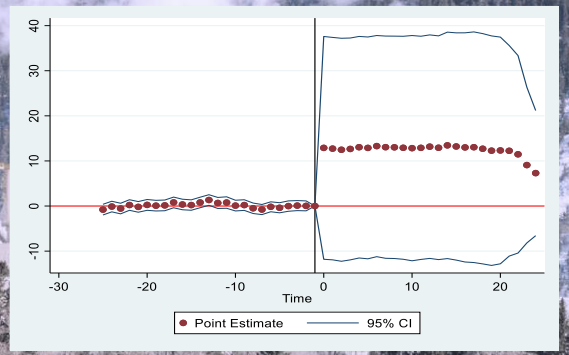
Conclusions:

- Individual country tests give mixed results
- Finland big driver of combined models results
- Potential issues of model power with year dummies in individual models
- Access to monthly emissions data would greatly improve power
- Need different controls to apply model ideas to Low-Middle income nations
- Would be interesting to look at new type of carbon taxes
- Could be done w/ Micro-level industry data

Finland Event Study



Sweden Event Study



Denmark Event Study