Oil Price Episodes and the U.S. Economic Production Network

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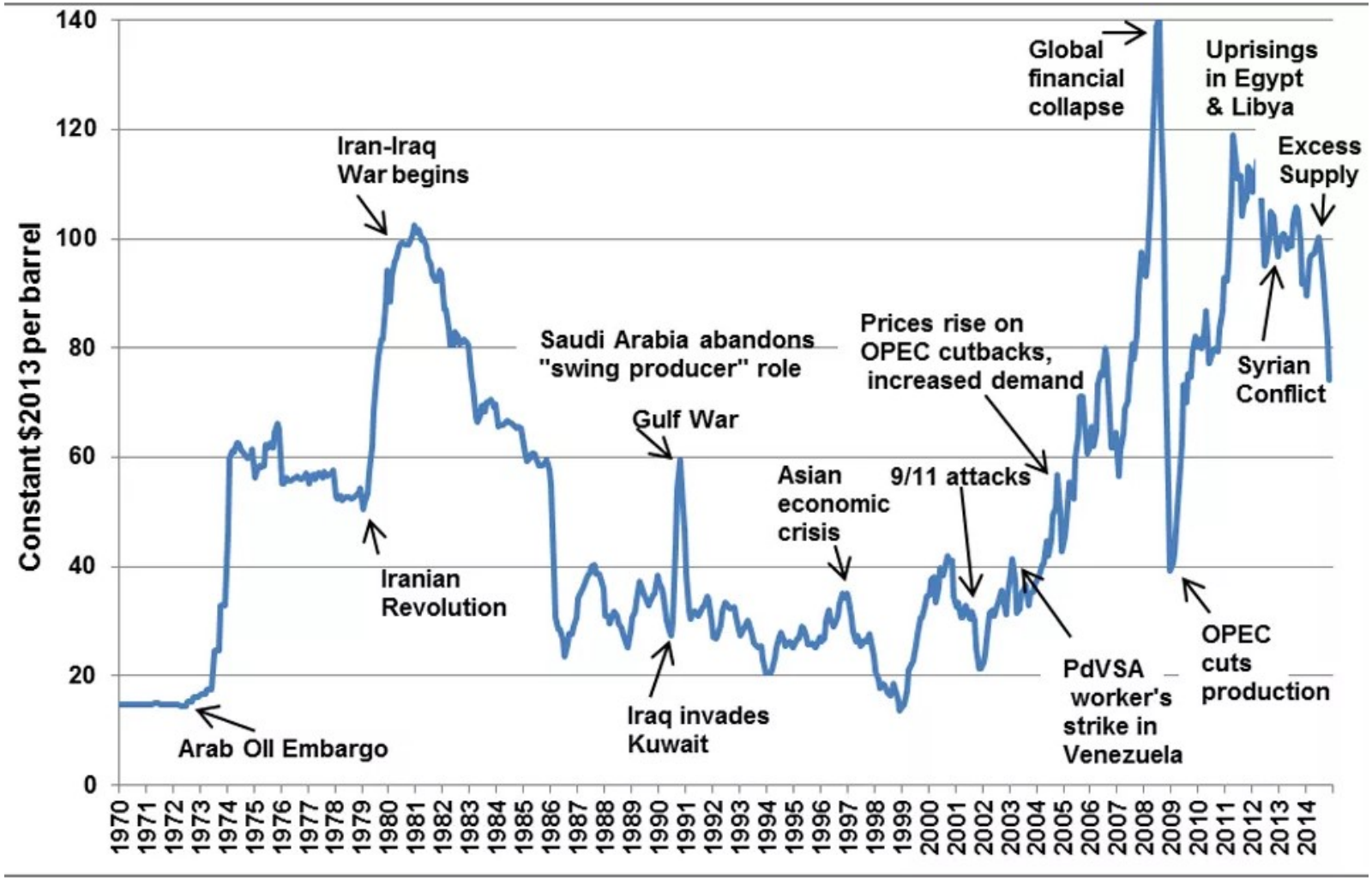
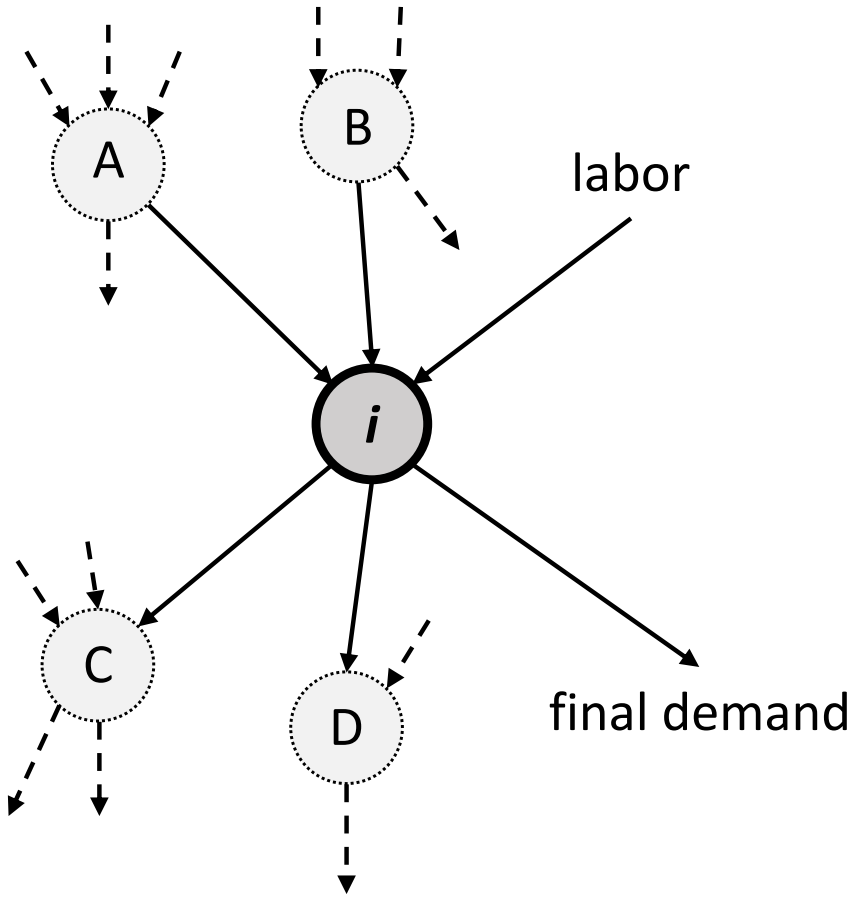
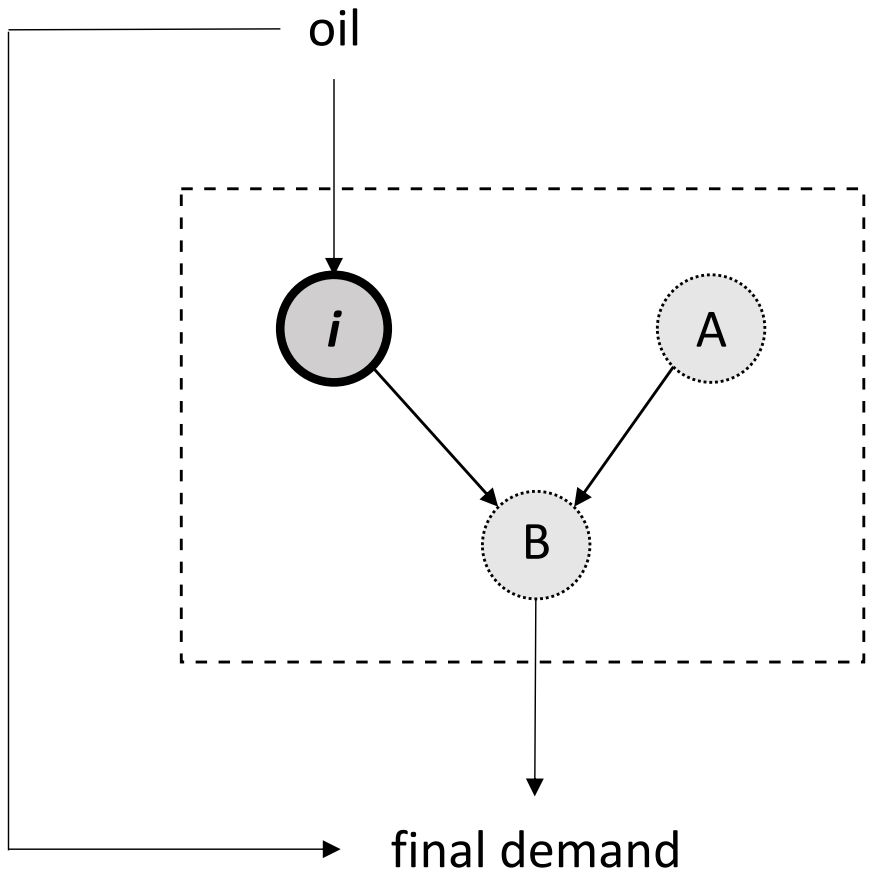
U.S. Department of Energy: Historical Oil Prices



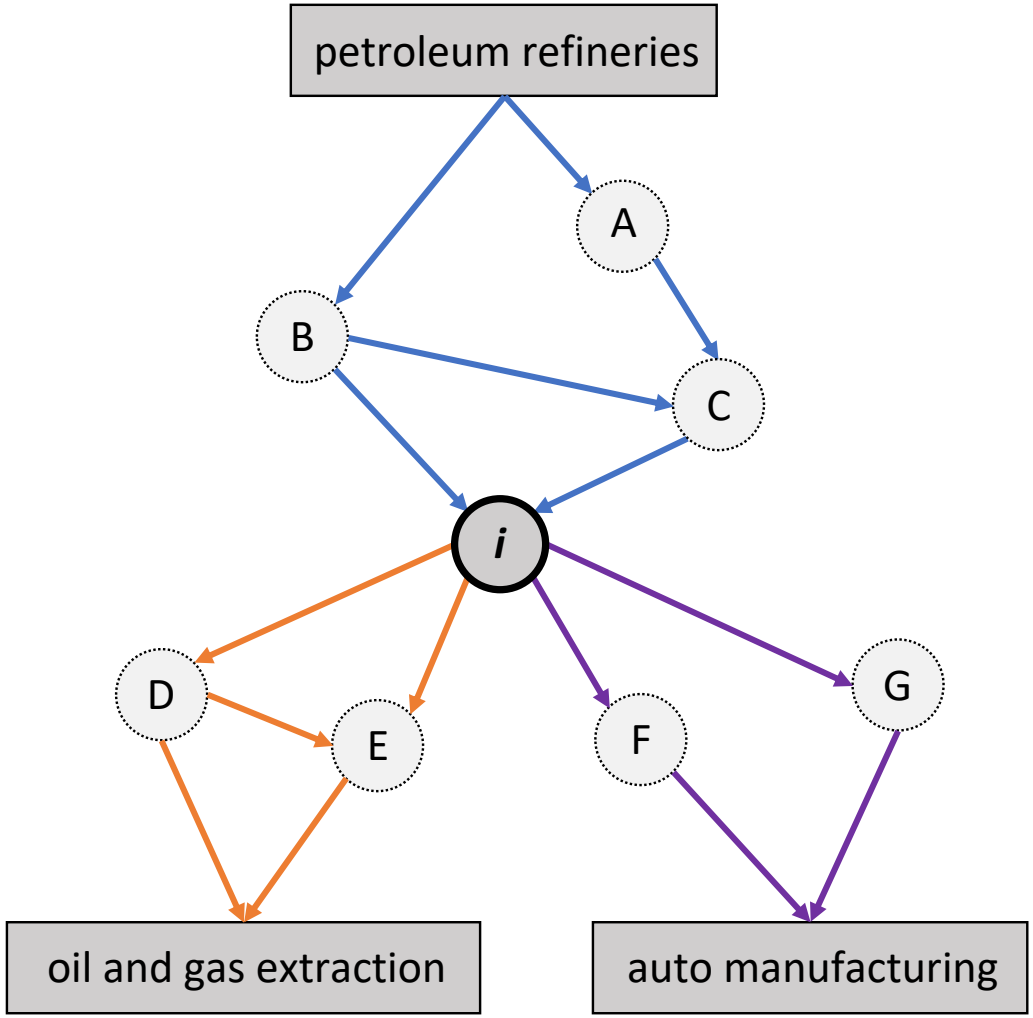
Economic Production Networks



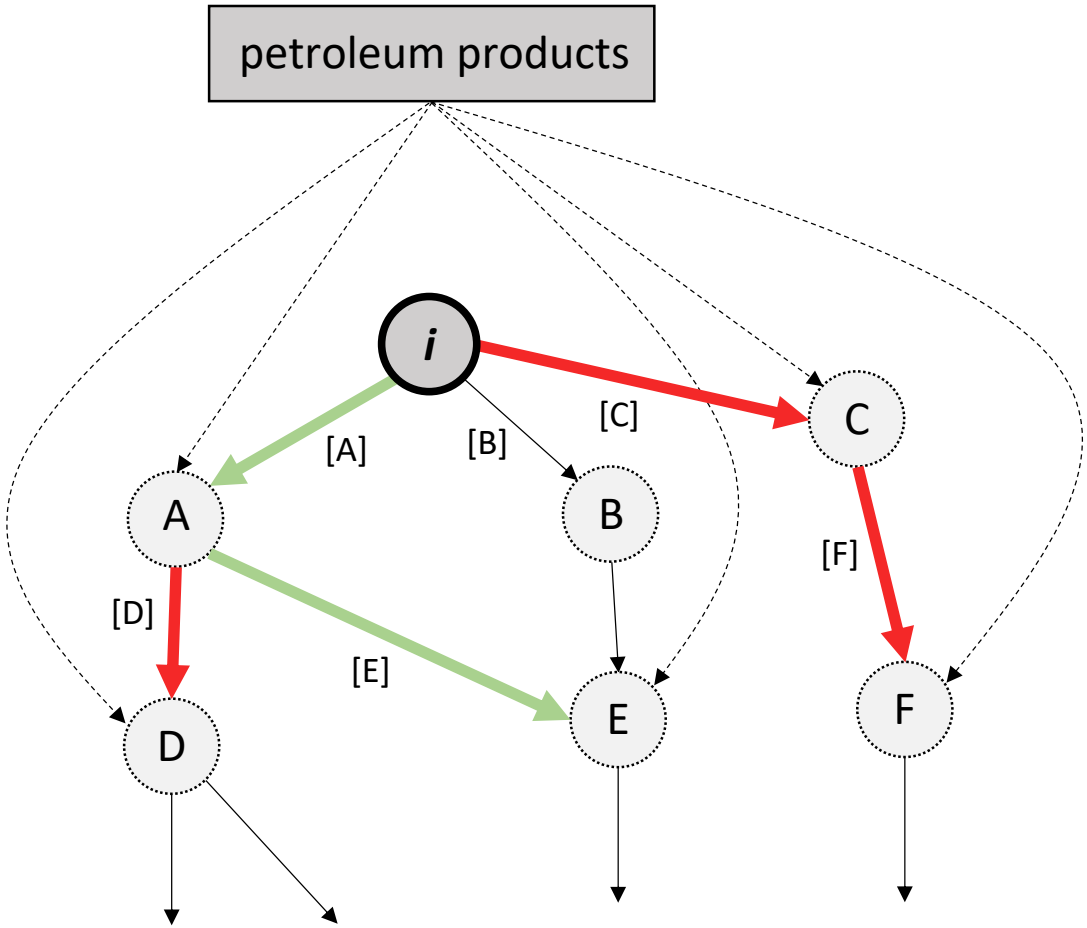
Three-Industry Example



Variable Construction: Supply and Demand Paths



Variable Construction: Demand-Side Input Patterns



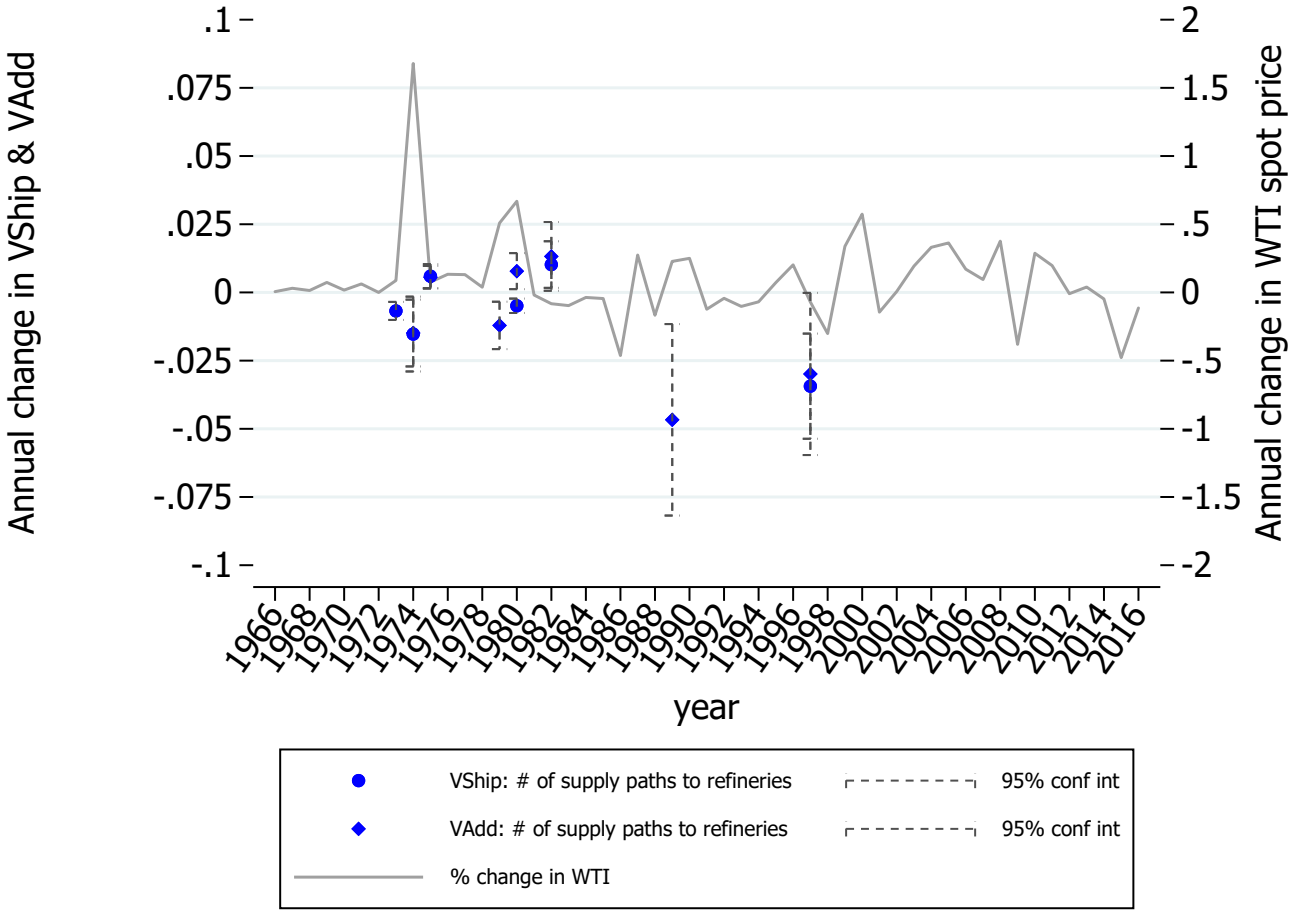
Regression

The primary specification is:

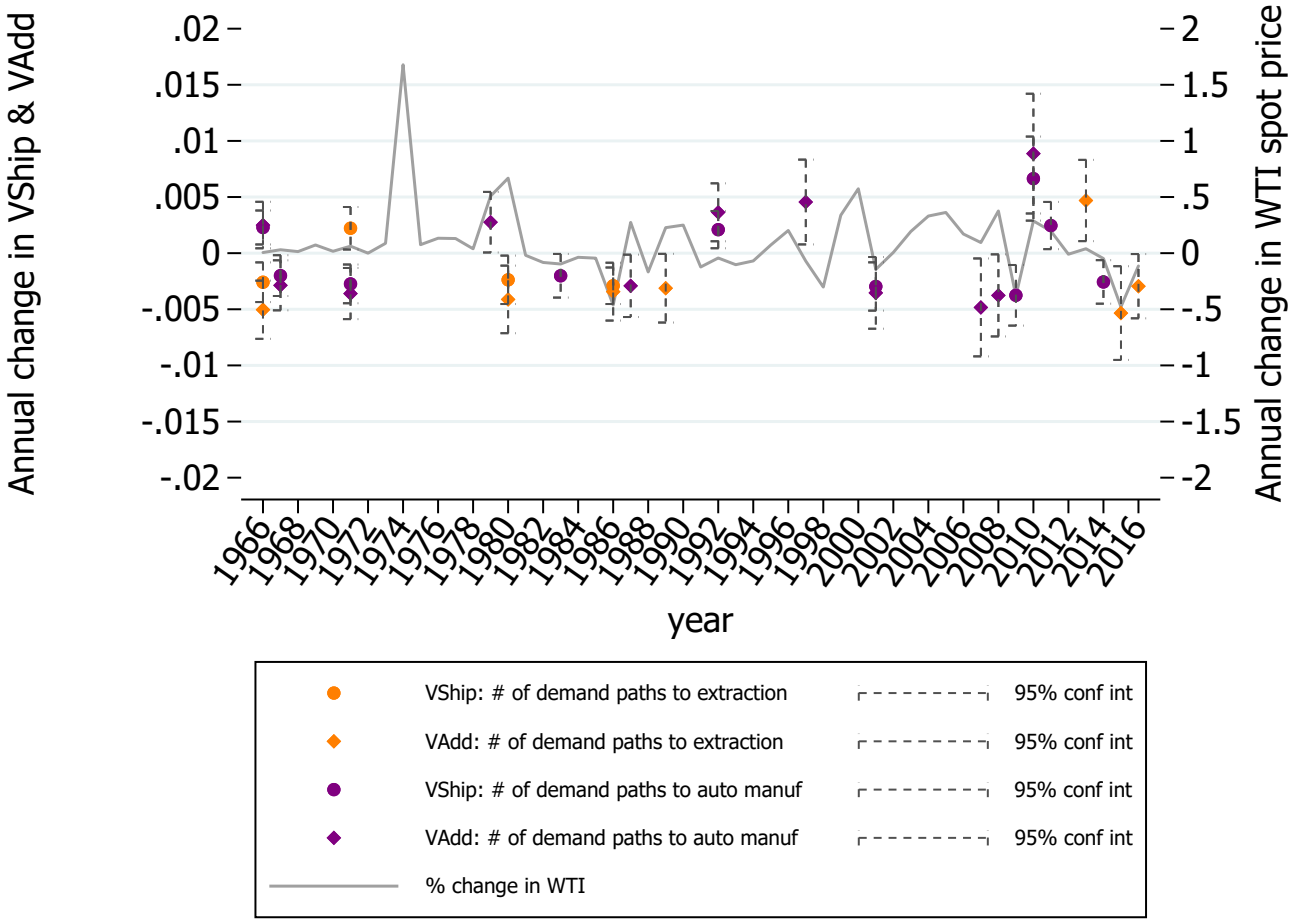
$$
\begin{aligned}
y_{it} = \alpha + Y_t + 2\text{digit}_i \cdot Y_t + emp_{it} + \\
\beta_{refining} \cdot \log(\text{supply\_paths\_refining}_i) + \beta_{refining,t} \cdot \log(\text{supply\_paths\_refining}_i) \cdot Y_t + \\
\beta_{extract} \cdot \log(\text{demand\_paths\_extract}_i) + \beta_{extract,t} \cdot \log(\text{demand\_paths\_extract}_i) \cdot Y_t + \\
\beta_{auto} \cdot \log(\text{demand\_paths\_auto}_i) + \beta_{auto,t} \cdot \log(\text{demand\_paths\_auto}_i) \cdot Y_t + \\
\beta_{dcomp} \cdot \log(\text{down\_ratio\_comp}_{h(i)}) + \beta_{dcomp,t} \cdot \log(\text{down\_ratio\_comp}_{h(i)}) \cdot Y_t + \\
\beta_{dsubs} \cdot \log(\text{down\_ratio\_subs}_{h(i)}) + \beta_{dsubs,t} \cdot \log(\text{down\_ratio\_subs}_{h(i)}) \cdot Y_t + \\
\beta_{ucomp} \cdot \log(\text{up\_ratio\_comp}_{h(i)}) + \beta_{ucomp,t} \cdot \log(\text{up\_ratio\_comp}_{h(i)}) \cdot Y_t + \\
\beta_{usubs} \cdot \log(\text{up\_ratio\_subs}_{h(i)}) + \beta_{usubs,t} \cdot \log(\text{up\_ratio\_subs}_{h(i)}) \cdot Y_t + \varepsilon_{it}
\end{aligned}
$$

where y_{it} is either the percentage change in the value of shipments or the percentage change in value added, Y_t is a set of year fixed-effects, 2digit_i is a set of 2-digit-NAICS fixed effects, emp_{it} is the percentage change in employment, $h(\cdot)$ maps from 6-digit-NAICS industries to their 3-digit-NAICS counterparts, and the other regressors are calculated as described previously.

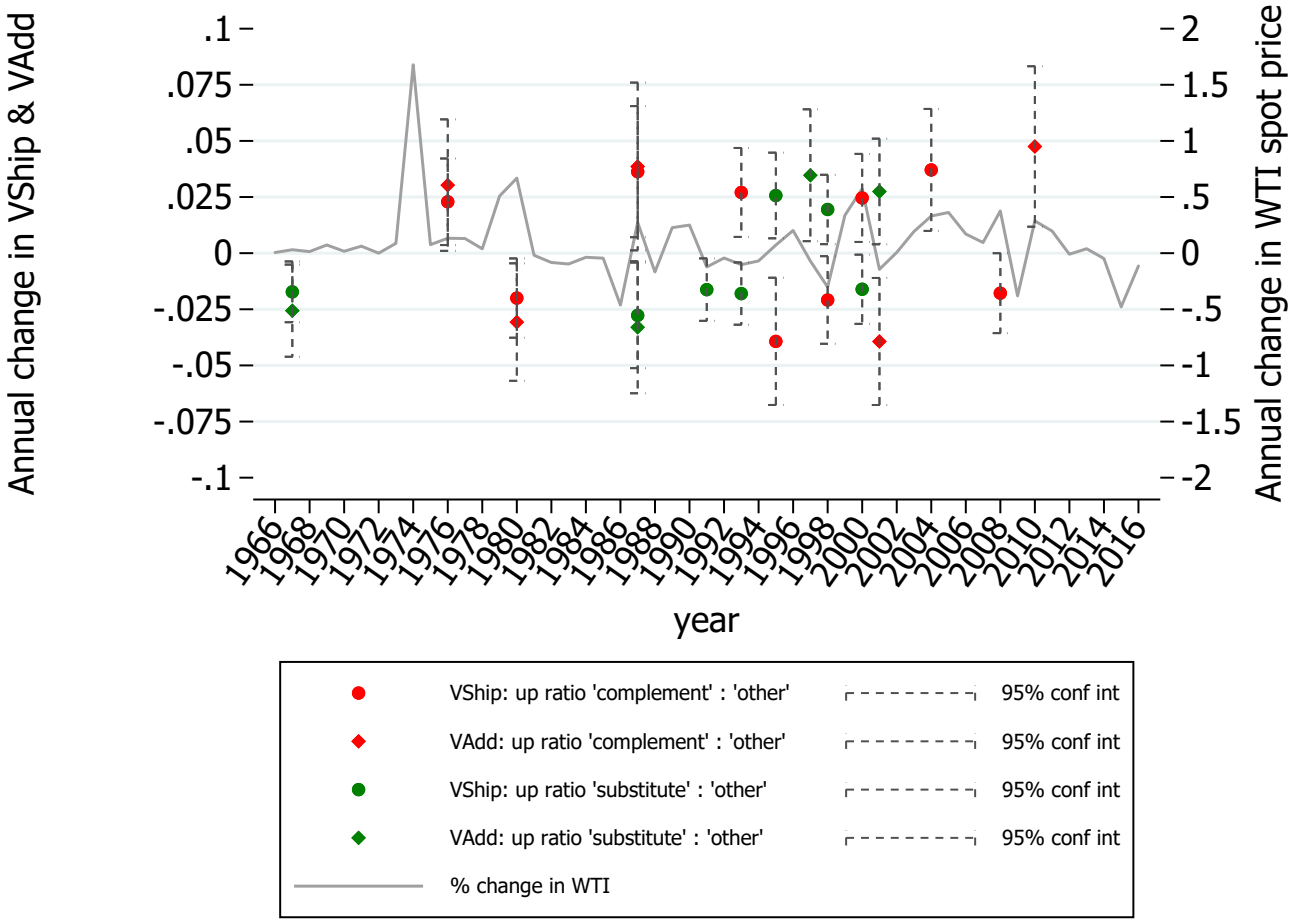
Results: Supply Path Covariate



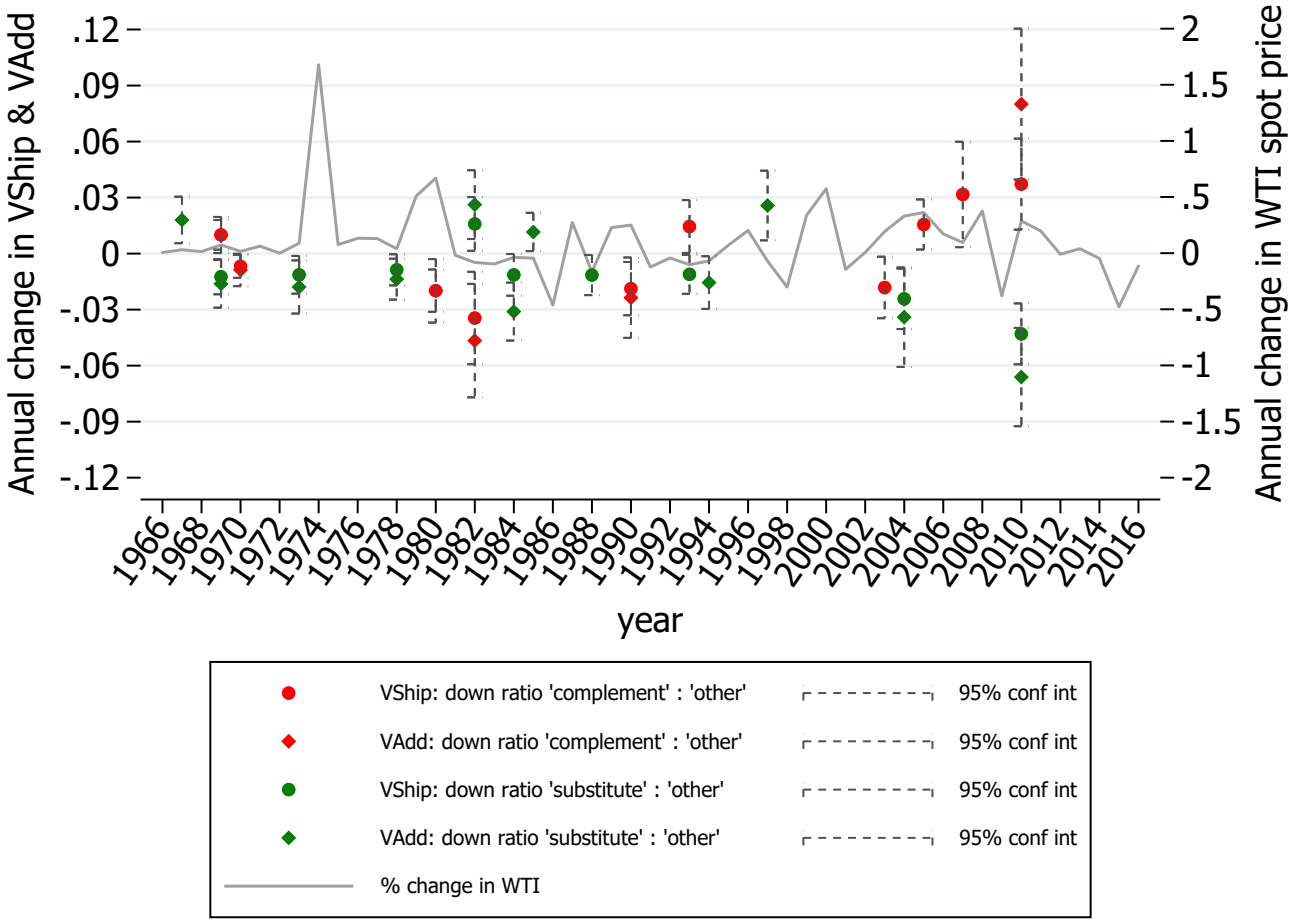
Results: Demand Path Covariates



Results: Supply-Side Input Covariates



Results: Demand-Side Input Covariates



Appendix: Covariate Summary Statistics

Variable	Mean	Std Dev	Min	Max
supply_paths_refining	31.08	16.81	0	96.72
demand_paths_extraction	0.42	0.92	0	6
demand_paths_auto	2.61	5.87	0	37
down_complement_paths	0.197	0.115	0.010	0.433
down_substitute_paths	0.194	0.174	0.136	0.839
up_complement_paths	0.353	0.163	0.078	0.696
up_substitute_paths	0.094	0.081	0.014	0.382
down_ratio_comp	0.445	0.541	0.011	7.165
down_ratio_subs	0.753	2.585	0.018	38.176
up_ratio_comp	0.894	0.775	0.090	3.779
up_ratio_subs	0.279	0.507	0.022	2.923

Appendix: Covariate Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) supply_paths_refining	1.00						
(2) demand_paths_extraction	-0.01	1.00					
(3) demand_paths_auto	-0.02	0.71	1.00				
(4) down_complement_paths	0.07	0.21	0.27	1.00			
(5) down_substitute_paths	0.02	-0.08	-0.10	-0.10	1.00		
(6) up_complement_paths	-0.01	-0.09	-0.12	-0.10	0.45	1.00	
(7) up_substitute_paths	0.17	0.02	-0.03	0.17	-0.10	0.15	1.00

Appendix: Covariate Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) supply_paths_refining	1.00						
(2) demand_paths_extraction	-0.01	1.00					
(3) demand_paths_auto	-0.02	0.71	1.00				
(4) down_ratio_comp	0.10	0.01	0.04	1.00			
(5) down_ratio_subs	0.04	-0.07	-0.07	0.88	1.00		
(6) up_ratio_comp	0.08	-0.09	-0.14	0.11	0.17	1.00	
(7) up_ratio_subs	0.14	-0.03	-0.09	0.03	0.05	0.73	1.00

Appendix: Non-Interaction Terms

	value of shipments	value added
supply paths to referineries	-0.00577**	-0.00725***
	(0.00252)	(0.00233)
demand paths to oil/gas extraction	-0.00190**	0.000139
	(0.000776)	(0.00124)
demand paths to auto manufacturing	0.00237***	0.00177*
	(0.000689)	(0.00102)
downstream ratio of complement : other	-0.00828**	-0.0114**
	(0.00377)	(0.00460)
downstream ratio of substitute : other	0.00253	0.0117**
	(0.00382)	(0.00513)
upstream ratio of complement : other	-0.0107*	-0.0134
	(0.00613)	(0.0100)
upstream ratio of substitute : other	0.00828	0.0125
	(0.00537)	(0.00826)
N	10,779	10,779
adj. R^2	0.650	0.482

Standard errors clustered by industry.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$