CompNet The Competitiveness Research Network

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Reacting to energy price shocks
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Roadmap

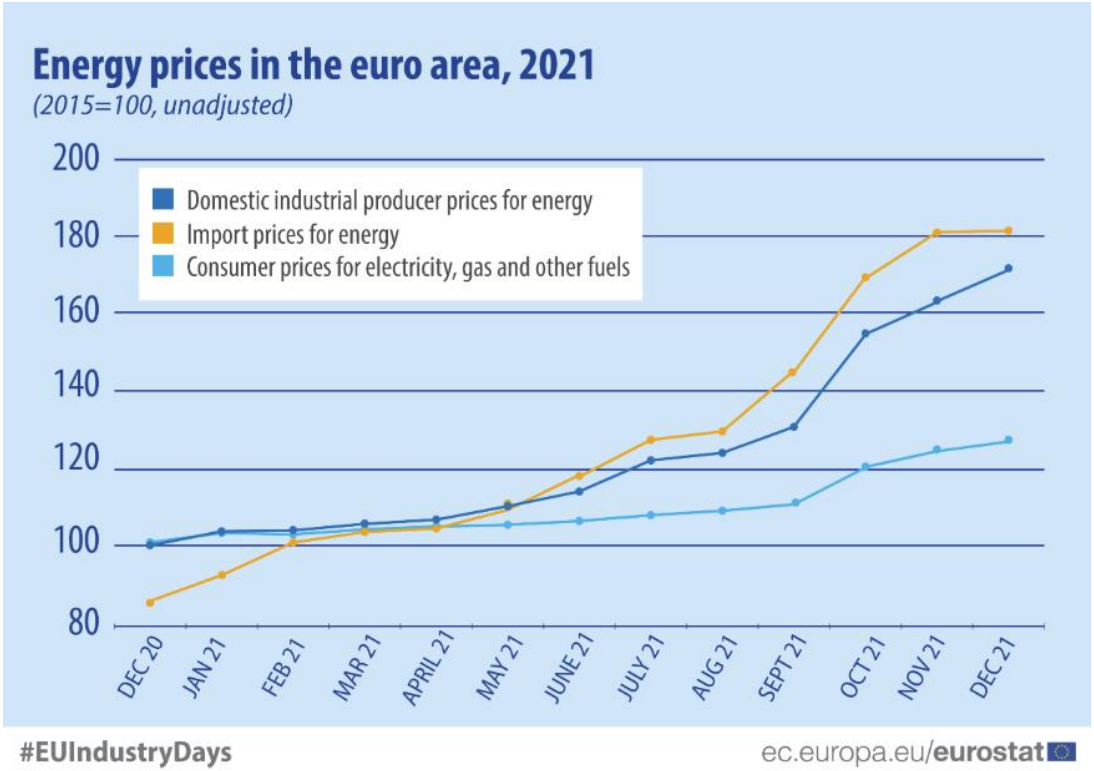
1. Motivation
2. Trends in energy prices, energy mix, and energy intensity
3. Methodology
4. Impact of energy price shocks on firms: average effect
5. Impact of energy price shocks on firms: cross-firm distributions
6. Future research agenda

Motivation

- New phase of globalization:
  - Global tensions, reconfiguration of supply chains
- Climate transition:
  - Demand to shift toward sustainable energy sources

→Turbulent energy markets, volatility in energy prices, transition at firm-level

- **How do firms respond to energy price shocks**
  - Losses in profitability? Employment?
  - → Broader economic implications?
- **Which firms are better suited to absorb these shocks?**



Reacting to energy price shocks

Firms can respond to energy price shocks by:

- Pass-through (Ganapati et al., 2020)
- Increase energy efficiency (Costantini and Mazzanti, 2012)
- Reduce expenditure in other inputs (Marin and Vona, 2021)
- Bear costs (Rentschler and Kornejew, 2017)
- Switch to alternative energy sources (Rentschler and Kornejew, 2017)

Data

- Data used:
  - Energy prices (EUR/TJ), International Energy Agency (IEA)
  - Energy consumption (TJ), World Input-Output Database Environmental Accounts (WIOD)
  - Other energy- and firm-variables, CompNet 9th vintage
- 8 countries studied:
  - Denmark, Finland, Germany, Lithuania, Poland, Portugal, Slovenia, Slovakia
- Energy sources studied:
  - Electricity, Natural gas, Fossil fuels (Diesel, Gasoline, Fuel oil)

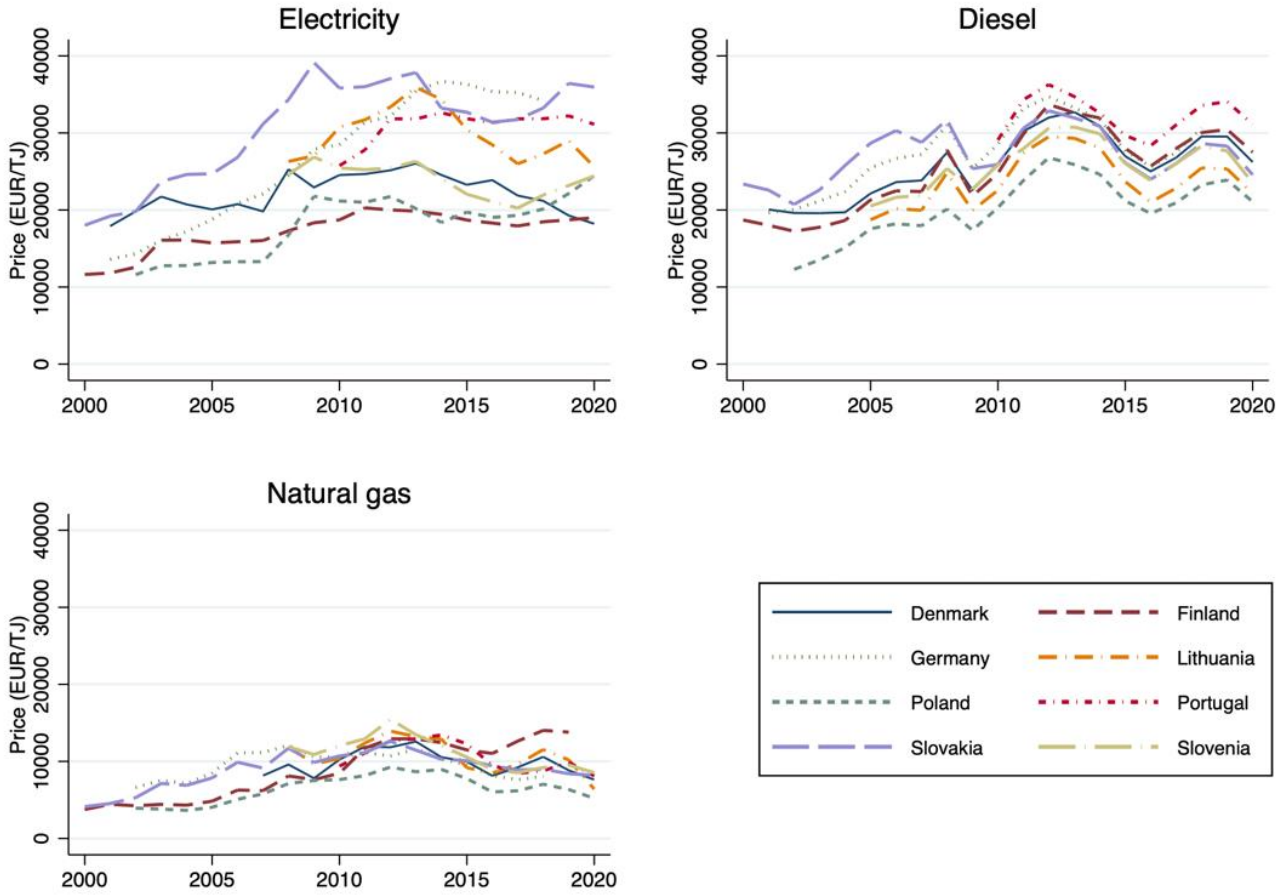
Trends in energy prices, energy mix, and energy intensity

Developments in energy prices

- Cross-country developments
  - Electricity exhibits most price heterogeneity cross-country → special market determination, countries produce electricity differently
  - Diesel follows similar patterns → pre-tax price determined internationally, taxation policies true source of variation
  - Natural gas → cheapest, some cross-country variation exists

- Main message: Prices of different energy sources vary significantly over time → can be exploited in our analysis of firm responses

Mean energy prices (EUR/TJ), 2000-2020

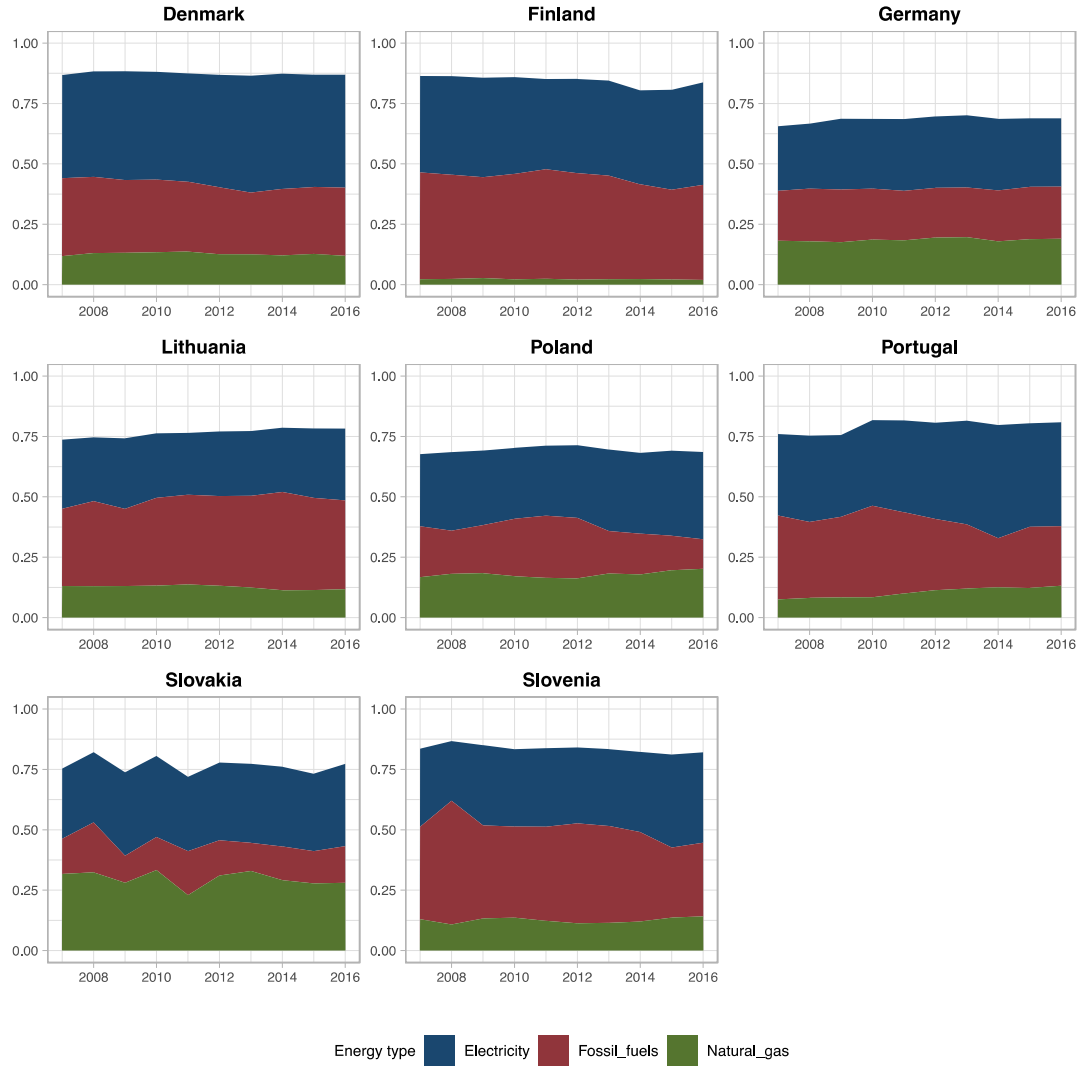


Source: IEA
Note: Prices refer to prices after tax, ie. prices after all taxes and levies.

Developments in energy mix – cross-country

- Selected energy sources account for ~ 75%
  - Electricity, fossil fuels used across countries
  - Natural gas showing more variation
  - → infrastructure, access to natural resources, primary economic activities
- Portugal, Slovakia, Slovenia exhibit more variation in energy mix over time, but overall relatively stable

Energy mix share at country level (% of total), 2007-2016



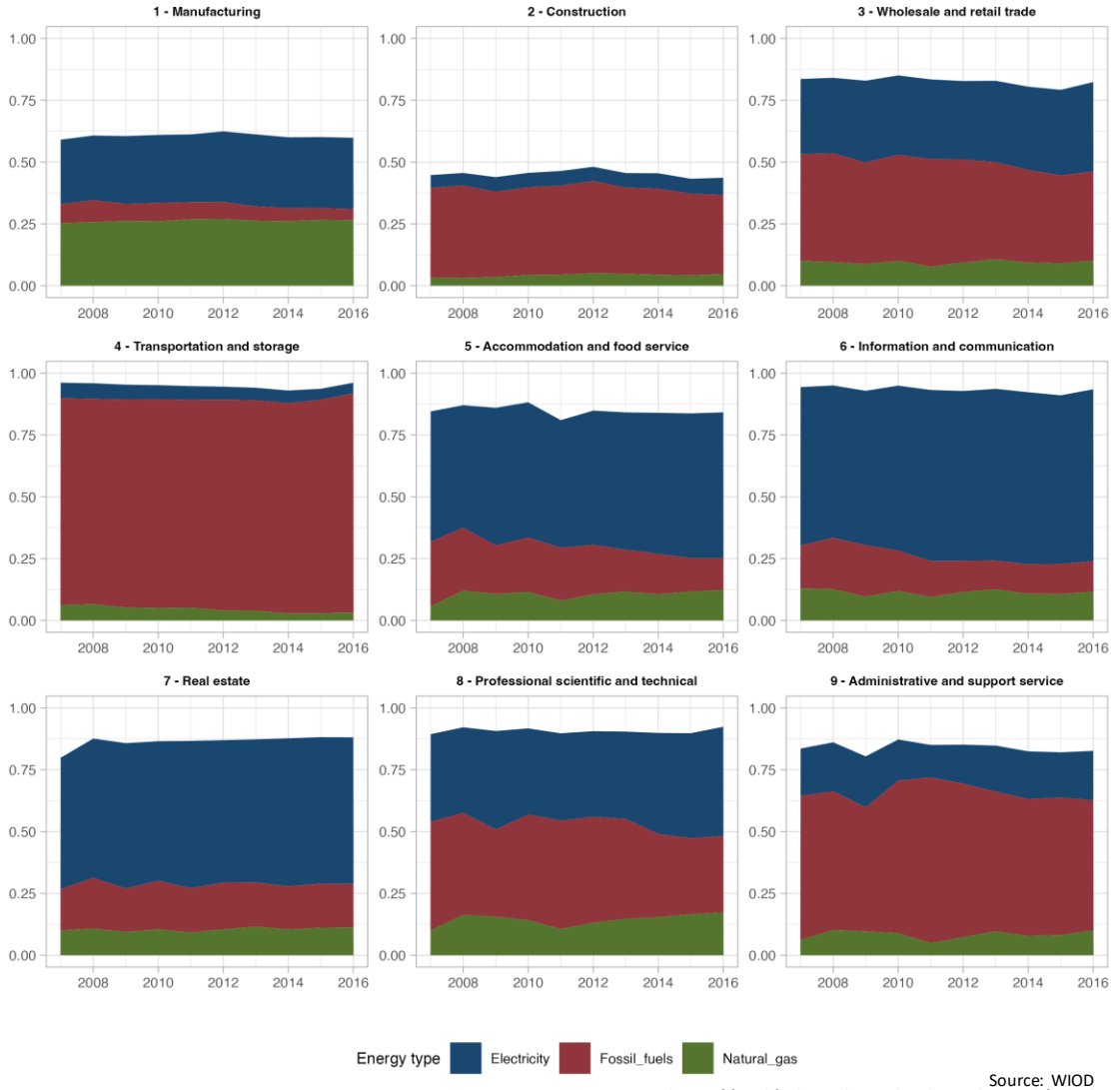
Source: WIOD

Note: Share of fossil fuels combines diesel, gasoline and fuel oil

Developments in energy mix – macro-sector

- Greater variation in energy mix
  - → use of different technologies and energy inputs
- Manufacturing heavy reliance on natural gas → countries with large manufacturing sector more at exposed (Germany, Poland)
- Transport heavy use of fossil fuels

Energy mix share at macro-sector level (% of total), 2007-2016

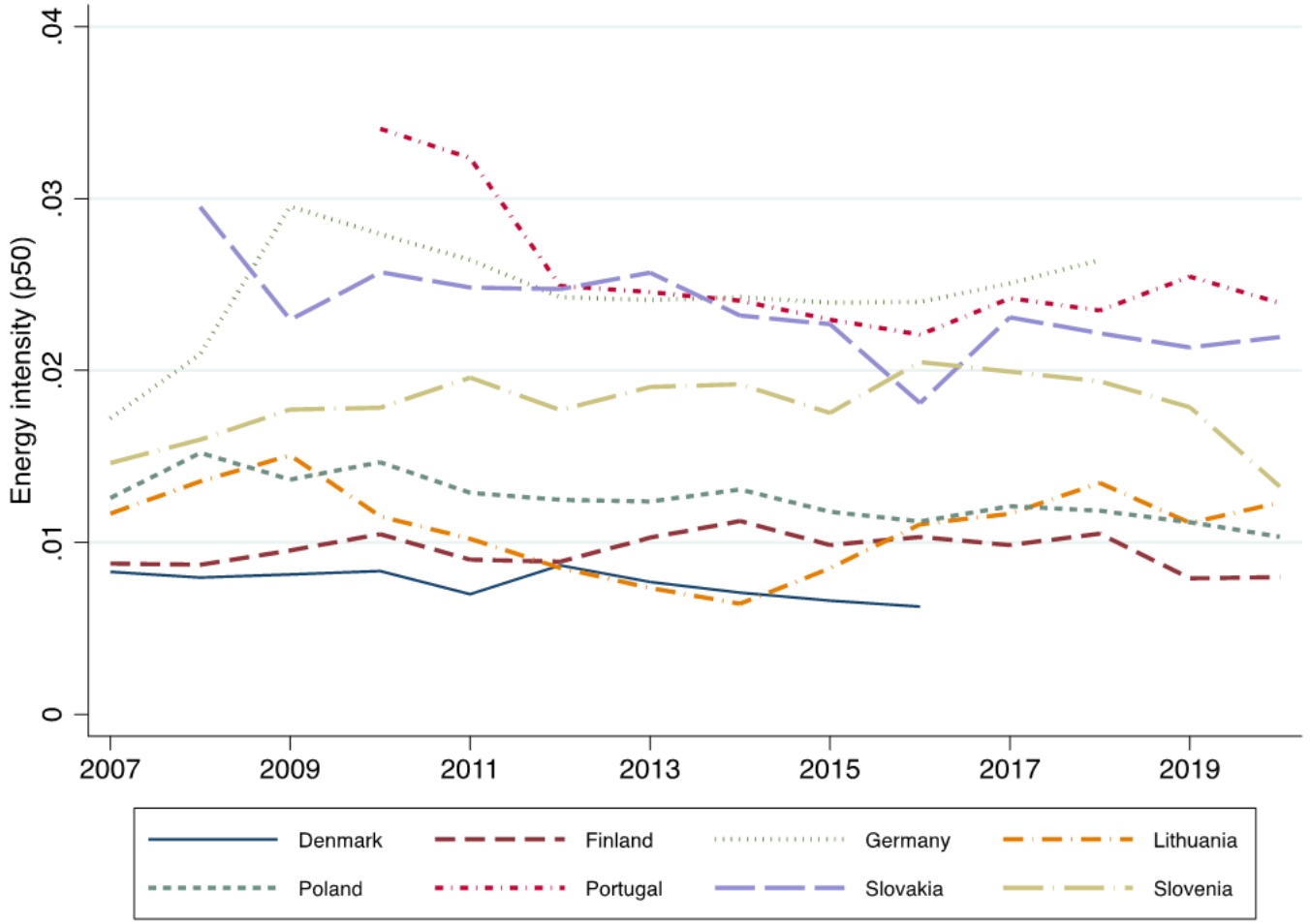


Source: WIOD
Note: Share of fossil fuels combines diesel, gasoline and fuel oil
Manufacturing sector industries like non-metallic minerals and metals use coal in production while manufacture of paper and wood industries use renewables. Construction sector uses LPG

Developments in energy mix – macro-sector

- Energy intensity: energy cost / total cost
- Energy intensity remains relatively stable over time
- Substantial level differences:
  - Portugal at around 2.5%, declining,
  - Denmark < 1%
- Decline: technological improvements? Phasing out or offshoring of energy intensive activities?

Median firm-level energy intensity, 2007-2020



Source: CompNet 9th Vintage, unconditional_industry2d_20e_weighted.dta
Note: energy intensity is defined as nominal energy cost over total costs

Trends in energy prices, energy mix, and energy intensity

1. There is large historical variation on energy prices, which we can exploit in an analysis of firm response
2. The energy mix at country and sector level stays stable over time, suggesting that there is little evidence of switching to other energy sources
3. Firm energy intensity remains stable over time

Methodology

Selection of energy sources – Principal Component Analysis

- PCA: select energy sources: reduce dimensionality and identify primary sources of variation

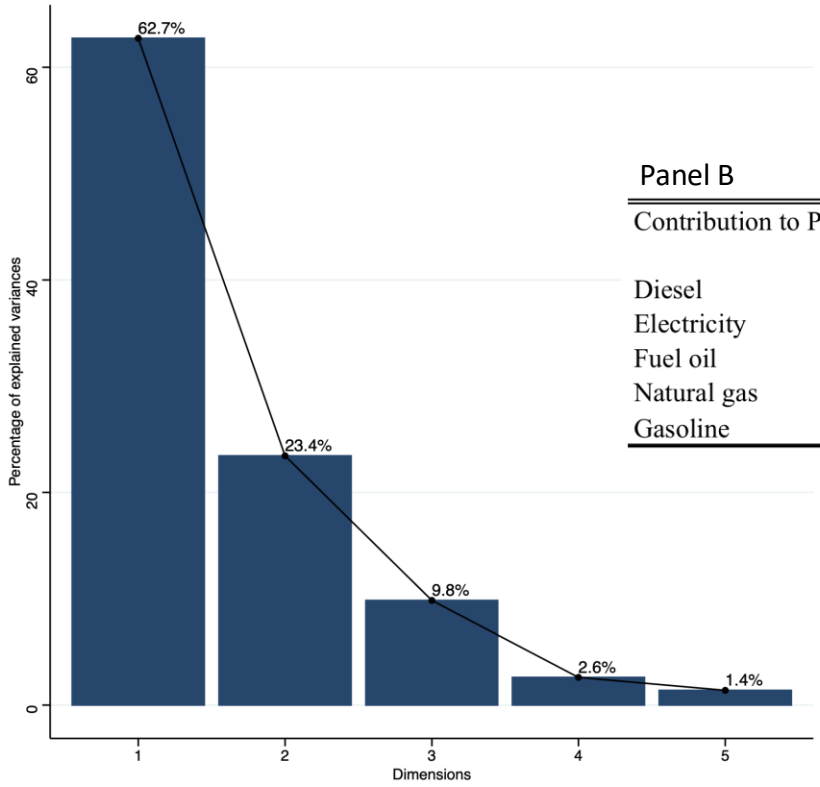
  → Avoid collinearity issues, without leading to omitted variable bias if excluding sources

Results:

- Decomposition of PCA (Panel A):
  - 63% of combined variance explained by PC1
  - PC1-PC3 explain over 95% of variance
- Contribution to PC (Panel B):
  - PC1: Diesel, Fuel oil, Gasoline; 'Fossil fuels'
  - PC2: Electricity
  - PC3: Natural gas

Results of the PCA

Panel A



Panel B

Contribution to PC (%):	PC1	PC2	PC3
Diesel	28,2	3,2	8,0
Electricity	2,1	78,6	0,1
Fuel oil	23,2	16,4	1,3
Natural gas	21,1	0,5	62,9
Gasoline	25,4	1,3	27,8

Source: IEA
Note: Percentage of total variance explained by each principal component (Panel A)
Share of the variance of each PC represented by the baseline prices (Panel B).

Methodology – Regression equation

- Independent variables:
  - 3 PCs: Fossil fuels, Electricity, Natural gas
  - For each industry, ex-ante exposure measure to the fluctuations of energy prices by matching industry-wide energy mix to CompNet industry-level data
- Dependent variables:
  - Profitability
  - Energy / VA (inverse of energy efficiency)
  - Job destruction rate
  - Energy cost share (energy cost / labor + material costs)
  - Trade intensity (exports / revenues)
  - 'Green share' (renewables / total energy)

  → All changes in average industry-level, expect JDR which is average

Main regression equation:

$$Y_{jct} = \alpha_0 + \alpha_j + \alpha_t + \sum_e \beta_e * \ w_{jct-1e} * \Delta\rho_{et} \ + \gamma' * X_{jct} + \epsilon_{jct}$$

Computation of weights and price change:

$$w_{jct-1e} * \Delta\rho_{et} = \frac{Q_{jct-1e}}{\sum_e Q_{jct-1e}} * \frac{\rho_{et} - \rho_{et-1}}{\rho_{et-1}}$$

Impact of short-term energy prices shocks: average results

Main regression results 1: average results

- Profitability decreases:
  - Because firms seem unable to increase energy efficiency?
- Energy cost share increases
- Pass through?:
  - Profitability captures net effect of energy cost share and pass-through; unable to disentangle
- Insignificant impact on JDR:
  - Strict labor market laws?
- Decrease in exports
- Switch energy sources?
  - No shift towards greener energy mix
  - BUT shock in natural gas associated with a reduction green share → cheaper?

Impact of energy shocks: average effect

VARIABLES	(1) Profitability	(2) Job destruction rate	(3) Energy cost share	(4) Energy / VA	(5) Export share	(6) Investment / assets	(7) Green share
weigh. Δ PC:							
Fossil fuels	-0.063	-0.009	0.118*	-0.152	0.187	5.176	0.000
	(0.049)	(0.097)	(0.070)	(0.105)	(0.221)	(42.169)	(0.048)
Electricity	-0.029**	-0.039	0.006**	0.002	-0.016	-38.845	-0.027
	(0.014)	(0.036)	(0.003)	(0.002)	(0.018)	(38.431)	(0.017)
Natural gas	-0.117***	0.074	-0.018**	-0.008	-0.238***	156.338	-0.097**
	(0.045)	(0.048)	(0.009)	(0.009)	(0.068)	(153.538)	(0.046)
Constant	-0.032***	0.121***	-0.015***	0.000	0.011	10.037	0.000
	(0.009)	(0.024)	(0.003)	(0.002)	(0.024)	(11.033)	(0.003)
Observations	1,978	2,054	2,036	2,046	1,170	1,433	2,058
R-squared	0.458	0.345	0.286	0.032	0.134	0.044	0.034
Number of ID	253	254	254	253	142	188	254
Year FE	YES	YES	YES	YES	YES	YES	YES

Results are from a fe-panel regression at the country-industry level. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Clustered std. errors at the country-industry level. Omitted coefficients for control variables: profitability, revenues, firm size (employment), number of firms, average markup on intermediate inputs, average industry energy intensity. Results based on 20e weighted sample, countries included: DK, DE, FI, HR, LT, PL, PT, SI, SK. Industries included: 10, 13, 14, 17, 18, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 42, 45, 46, 47, 60, 61, 70, 78, 80, 81, 82. Dependent variables are in first differences.

Main regression results 2: cross-country heterogeneity

- Profitability decreases
  - Germany and Lithuania
  - Different energy sources

Profitability

VARIABLES	(1) Denmark	(2) Finland	(3) Germany	(4) Lithuania	(5) Poland	(6) Portugal	(7) Slovakia	(8) Slovenia
weigh. Δ PC:								
Fossil fuels	0.099	0.134	-0.415	-0.516**	-0.059	0.236	-0.044	0.038
	(0.133)	(0.113)	(0.452)	(0.192)	(0.048)	(0.236)	(0.203)	(0.239)
Electricity	0.047	-0.153	-0.411***	-0.070	-0.022	-0.120	-0.095	-0.160
	(0.032)	(0.118)	(0.130)	(0.092)	(0.028)	(0.146)	(0.087)	(0.113)
Natural gas	-0.092	0.191	-0.032	-0.212	0.055	0.501***	0.133	0.115
	(0.171)	(0.303)	(0.337)	(0.200)	(0.046)	(0.183)	(0.152)	(0.114)
Constant	-0.053	-0.035**	-0.072**	-0.047***	-0.042***	-0.044**	0.005	-0.009
	(0.035)	(0.014)	(0.034)	(0.016)	(0.012)	(0.019)	(0.021)	(0.023)
Observations	261	300	159	243	311	192	274	238
R-squared	0.599	0.597	0.579	0.600	0.463	0.569	0.593	0.474
Number of ID	32	34	19	34	35	34	33	32
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Results are from a fe-panel regression at the industry level. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Clustered std. errors at the country-industry level. Omitted coefficients for control variables: profitability, revenues, firm size (employment), number of firms, average markup on intermediate inputs, average industry energy intensity. Results based on 20e weighted sample, countries included: DK, DE, FI, HR, LT, PL, PT, SI, SK. Industries included: 10, 13, 14, 17, 18, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 42, 45, 46, 47, 60, 61, 70, 78, 80, 81, 82. Dependent variables are in first differences.

Main regression results 2: cross-country heterogeneity

- Job destruction rate increases
  - Germany, Lithuania, Poland

Job destruction rate

VARIABLES	(1) Denmark	(2) Finland	(3) Germany	(4) Lithuania	(5) Poland	(6) Portugal	(7) Slovakia	(8) Slovenia
weigh. Δ PC:								
Fossil fuels	0.301	-0.671*	0.602*	1.013***	-0.101	-0.333	0.651	-0.281
	(0.430)	(0.394)	(0.331)	(0.226)	(0.232)	(0.198)	(0.392)	(0.322)
Electricity	-0.042	-0.039	0.273***	0.540**	0.125**	0.182	0.233	0.117
	(0.231)	(0.199)	(0.084)	(0.197)	(0.054)	(0.167)	(0.182)	(0.218)
Natural gas	0.262	0.166	-0.062	0.031	0.023	-0.062	0.175	-0.026
	(0.379)	(0.726)	(0.075)	(0.211)	(0.115)	(0.100)	(0.370)	(0.130)
Constant	0.516*	-0.034	-0.017	0.231***	0.198***	0.133***	0.077**	0.004
	(0.301)	(0.052)	(0.021)	(0.028)	(0.048)	(0.020)	(0.034)	(0.085)
Observations	265	305	169	268	312	207	285	243
R-squared	0.579	0.315	0.619	0.783	0.469	0.645	0.566	0.463
Number of ID	32	34	19	34	35	35	33	32
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Results are from a fe-panel regression at the industry level. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Clustered std. errors at the country-industry level. Omitted coefficients for control variables: profitability, revenues, firm size (employment), number of firms, average markup on intermediate inputs, average industry energy intensity. Results based on 20e weighted sample, countries included: DK, DE, FI, HR, LT, PL, PT, SI, SK. Industries included: 10, 13, 14, 17, 18, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 42, 45, 46, 47, 60, 61, 70, 78, 80, 81, 82. Dependent variables are in first differences.

Main regression results 2: cross-country heterogeneity

- Energy cost share increases:
  - Germany, Lithuania, Poland, Portugal, Slovakia, Slovenia
  - Fossil fuels, electricity
  - Natural gas again opposite effect

Energy cost share

VARIABLES	(1) Denmark	(2) Finland	(3) Germany	(4) Lithuania	(5) Poland	(6) Portugal	(7) Slovakia	(8) Slovenia
weigh. Δ PC:								
Fossil fuels	0.013	0.438	0.075	0.108*	-0.012	0.200	1.134***	0.350*
	(0.013)	(0.269)	(0.072)	(0.062)	(0.015)	(0.176)	(0.318)	(0.176)
Electricity	-0.000	-0.006	0.035**	-0.020	0.016***	0.073**	-0.126	0.092*
	(0.004)	(0.040)	(0.016)	(0.031)	(0.005)	(0.030)	(0.125)	(0.046)
Natural gas	0.013	-0.363	-0.036**	0.008	0.001	-0.097**	-0.457**	-0.008
	(0.012)	(0.300)	(0.015)	(0.046)	(0.015)	(0.044)	(0.205)	(0.049)
Constant	-0.009***	-0.003	-0.016***	-0.005	-0.009***	-0.032***	0.014	-0.032***
	(0.003)	(0.014)	(0.002)	(0.004)	(0.002)	(0.005)	(0.011)	(0.007)
Observations	267	305	169	268	312	207	264	244
R-squared	0.429	0.409	0.631	0.631	0.587	0.781	0.475	0.575
Number of ID	32	34	19	34	35	35	33	32
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Results are from a fe-panel regression at the industry level. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Clustered std. errors at the country-industry level. Omitted coefficients for control variables: profitability, revenues, firm size (employment), number of firms, average markup on intermediate inputs, average industry energy intensity. Results based on 20e weighted sample, countries included: DK, DE, FI, HR, LT, PL, PT, SI, SK. Industries included: 10, 13, 14, 17, 18, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 42, 45, 46, 47, 60, 61, 70, 78, 80, 81, 82. Dependent variables are in first differences.

Main regression results 2: cross-country heterogeneity

- Energy efficiency increases:
  - Finland, Poland, Portugal, Slovakia, Slovenia
  - Mainly fossil fuels

Energy efficiency (energy / VA)

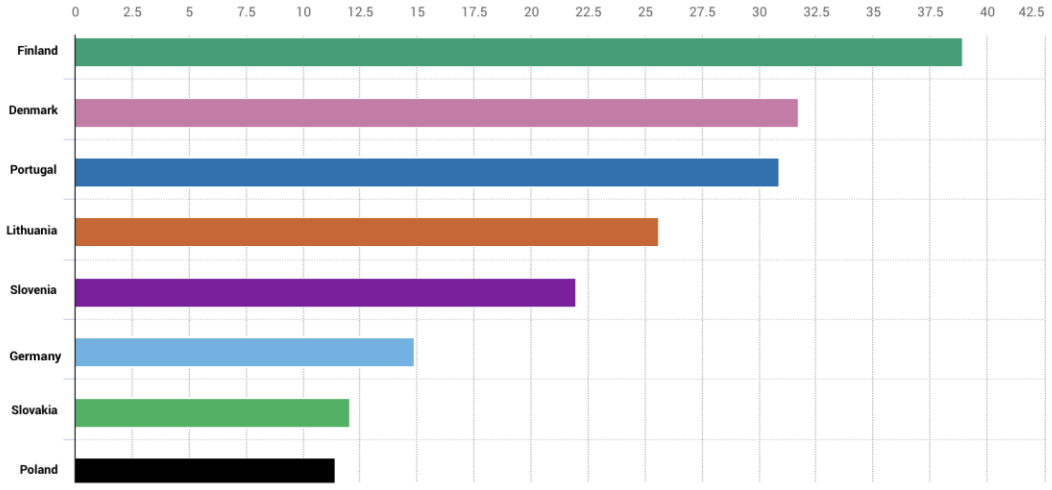
VARIABLES	(1) Denmark	(2) Finland	(3) Germany	(4) Lithuania	(5) Poland	(6) Portugal	(7) Slovakia	(8) Slovenia
weigh. Δ PC:								
Fossil fuels	0.110	-0.116*	0.153	-0.126	-0.469***	-0.177*	-0.756***	-0.188*
	(0.209)	(0.058)	(0.132)	(0.113)	(0.139)	(0.100)	(0.176)	(0.098)
Electricity	-0.011	0.037**	0.014	0.011	-0.036*	0.028	-0.094	0.004
	(0.010)	(0.014)	(0.024)	(0.049)	(0.021)	(0.039)	(0.085)	(0.025)
Natural gas	-0.056	-0.222	-0.030	0.395	0.148***	0.009	0.138**	-0.016
	(0.115)	(0.188)	(0.019)	(0.295)	(0.052)	(0.071)	(0.055)	(0.036)
Constant	-0.027	-0.002	-0.007***	-0.026	0.013	0.022***	0.014*	0.010*
	(0.038)	(0.004)	(0.002)	(0.018)	(0.008)	(0.007)	(0.007)	(0.006)
Observations	263	303	170	268	312	207	280	243
R-squared	0.191	0.117	0.092	0.343	0.378	0.084	0.246	0.296
Number of ID	31	34	19	34	35	35	33	32
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Results are from a fe-panel regression at the industry level. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Clustered std. errors at the country-industry level. Omitted coefficients for control variables: profitability, revenues, firm size (employment), number of firms, average markup on intermediate inputs, average industry energy intensity. Results based on 20e weighted sample, countries included: DK, DE, FI, HR, LT, PL, PT, SI, SK. Industries included: 10, 13, 14, 17, 18, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 42, 45, 46, 47, 60, 61, 70, 78, 80, 81, 82. Dependent variables are in first differences.

Impact of short-term energy prices shocks: average results

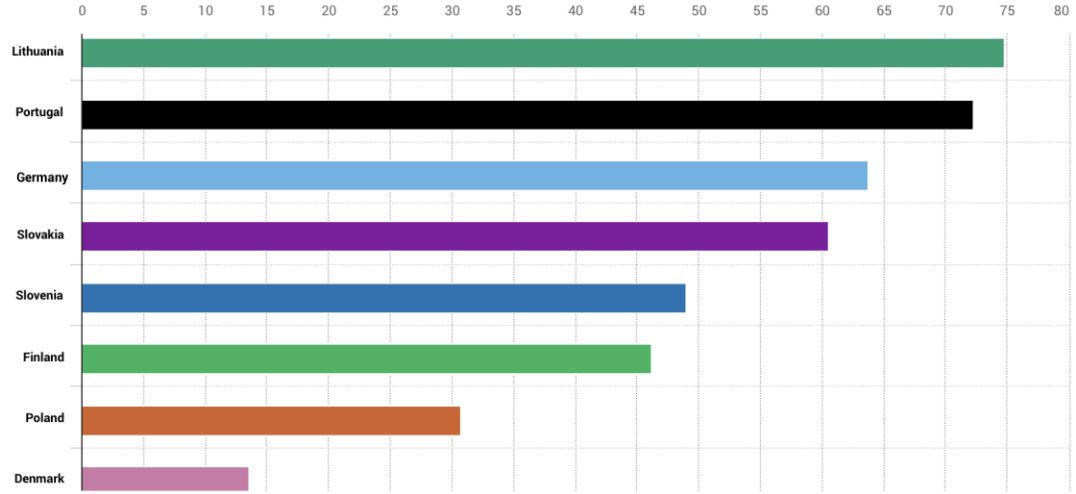
1. Energy price shocks are associated with an increase in energy costs and lower profits for firms
2. In Germany, Lithuania and Poland, they are also related to reductions in labor
3. In Finland, Poland, Portugal, Slovakia and Slovenia, fossil fuel price shocks are associated with an increase in energy efficiency
4. Countries more affected by energy price shocks:
   - Lower share of renewables & higher dependency on energy imports (Eurostat)
   - Interplay between policy and firm-behavior?

Share of energy from renewables



Source: Eurostat

Energy imports dependency



Source: Eurostat

Impact of short-term energy prices: cross-firm distribution

Dispersion

- Profitability dispersion insignificant
- Energy cost share dispersion increases following electricity price shocks
- Energy cost share dispersion decreases following natural gas price shocks:
  - Natural gas used as an intermediate input expenditure?
  - Natural gas becomes more expensive

  → total costs increase relative energy expenditure

  → Energy share decreases
- Firm heterogeneity seems only to matter on electricity price shocks

Impact of energy price shocks on profitability and energy cost share dispersion

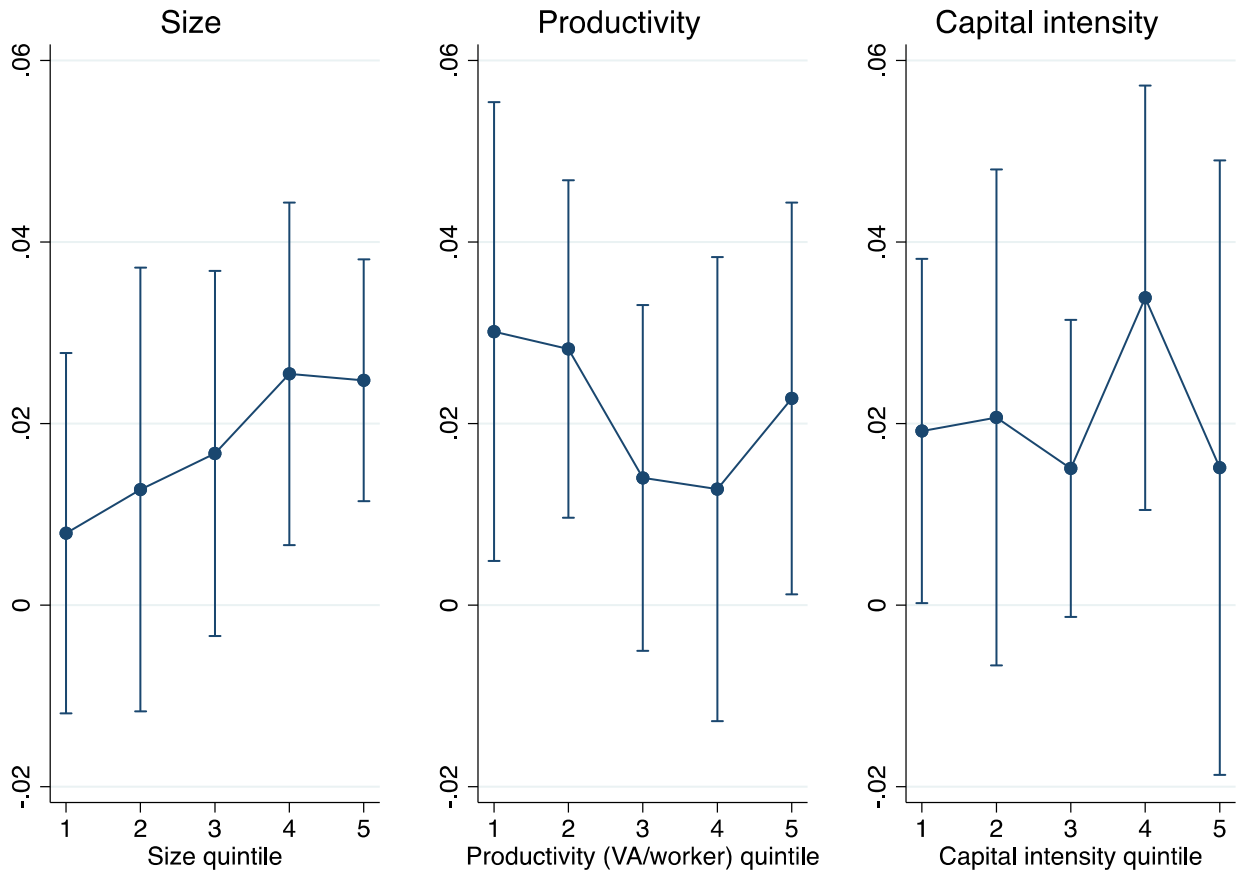
	SD		p90-p10		p75-p25	
VARIABLES	**(1) Profitability**	**(2) Energy cost share**	**(3) Profitability**	**(4) Energy cost share**	**(5) Profitability**	**(6) Energy cost share**
weigh. Δ PC:						
Fossil fuels	-0.051	0.028	-0.239	0.217*	-0.120*	0.123*
	(0.151)	(0.056)	(0.162)	(0.122)	(0.070)	(0.065)
Electricity	0.019	0.007**	0.029	0.018***	-0.024	0.011**
	(0.043)	(0.003)	(0.053)	(0.007)	(0.023)	(0.005)
Natural gas	-0.055	-0.028***	0.033	-0.053***	-0.003	-0.030***
	(0.079)	(0.011)	(0.166)	(0.017)	(0.052)	(0.010)
Constant	0.009	-0.006	0.012	-0.018**	0.018	-0.008
	(0.014)	(0.005)	(0.036)	(0.009)	(0.029)	(0.008)
Observations	2,055	2,033	2,039	2,015	2,039	2,015
R-squared	0.046	0.110	0.078	0.201	0.063	0.075
Number of ID	254	254	254	254	254	254
Year FE	YES	YES	YES	YES	YES	YES

Results are from a fe-panel regression at the country-industry level. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Clustered std. errors at the country-industry level. Omitted coefficients for control variables: profitability, revenues, firm size (employment), number of firms, average markup on intermediate inputs, average industry energy intensity. Results based on 20e weighted sample, countries included: DK, DE, FI, HR, LT, PL, PT, SI, SK. Industries included: 10, 13, 14, 17, 18, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 42, 45, 46, 47, 60, 61, 70, 78, 80, 81, 82. Dependent variables are in first differences.

Role of size, productivity, capital intensity?

- Firm heterogeneity seems only to matter on electricity price shocks
- Regression on changes in mean energy cost share, conditioning on quintiles of:
  - Firm size (log of employment)
  - Productivity (log of VA per worker)
  - Capital intensity (capital stock per worker)
- Size: more harmful for larger firms
- Productivity: more productive firms, less affected
- Capital intensity: impact increases but not monotonically
  - Economies of scale?
  - Securing own sources of energy or ability to negotiate prices more flexibly?

Heterogenous impact of electricity on energy cost share



Note: Results are from a fe-panel regression at the country-industry-quintile level. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Clustered std. errors at the country-industry-quintile level. The dependent variable is always the energy cost share, while omitted coefficients for control variables: profitability, revenues, firm size (employment), number of firms, average markup on intermediate inputs, average industry energy intensity. Results based on the joint distribution energy inputs 20e weighted sample, countries included: DK, DE, FI, HR, LT, PL, PT, SI, SK. Industries included: 10, 13, 14, 17, 18, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 42, 45, 46, 47, 60, 61, 70, 78, 80, 81, 82. Dependent variables are in first differences.

Conclusions

- In the short run, **increased energy prices** are mainly associated with **lower firm profits**; net effect of **increased energy costs and inability to pass-through** costs
  - Increased energy efficiency: FI, PL, PT, SK, SI
  - Increased job destruction rate: DE, LT, PL

→Policies to **increase flexibility of energy mix to increase resilience**: emphasize renewables

- Electricity price shocks increase dispersion in energy cost share
  - **Smaller**, **more productive firms** seem to be **less affected** by energy price shocks
  - Firms with **higher level of capital** per worker seem to experience **gains in efficiency**

→ Allowing workers to move to more productive, capital- intensive firms fosters resilience to energy price shocks

Future research agenda

France & Germany MDI Energy Research

- Research output:
  - Descriptives:
    - Energy efficiency & intensity: trends, average, firm dispersion, correlations with price
    - Energy mix: extent of reliance on multiple energy sources, flexibility over time, green transition → how susceptible are firms to energy price shocks, which channels in play (substitution between energy sources)? Are firms becoming "greener" (electricity production)?
  - Decomposition of growth rate of energy intensity:
    - How carbon tax affects each component (Morakinyo et al., 2020)?
  - Importance of creative destruction for green transition:
    - Elasticity of substitution between fossil fuels and green sources: firm-level, industry-level → is change happening at firm-level (within) or at aggregate-level (between, due to eg. firm entry/exit, increasing/decreasing market shares)?
    - Relative importance of the two channels to achieve a sustainable energy mix at country-level

→ Extend analysis to other countries: Slovenia, Portugal etc.

THANK YOU

Now we will open a discussion on this topic.

Anyone is welcome to share their inputs!

Sources

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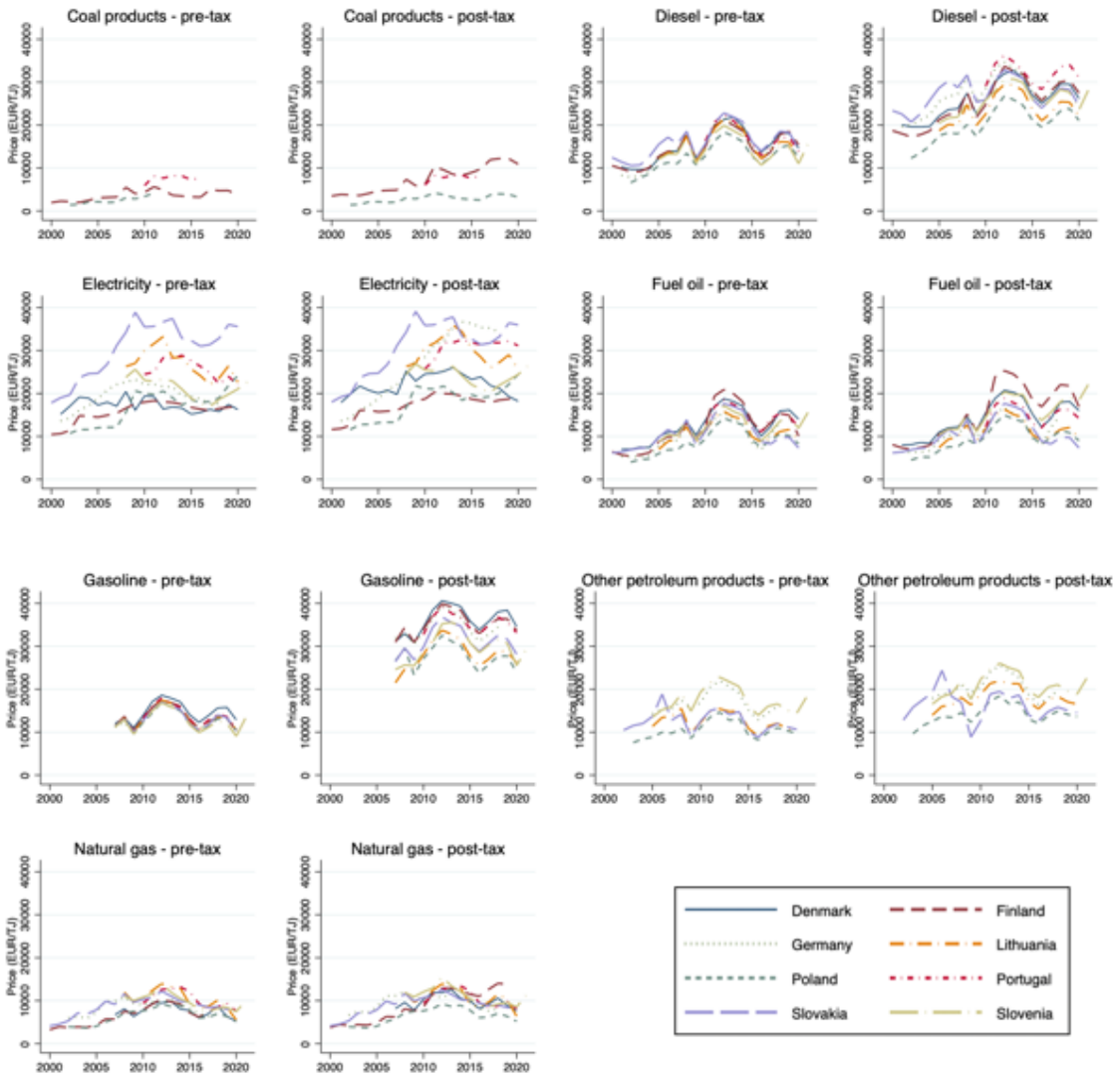
APPENDIX

Developments in energy prices – all energy sources



Source: IEA
Note: Post-tax prices include prices after all taxes and levies.

Main regression results 2: positive and negative shocks

- Similar results
- Profitability
- Energy cost share for fossil fuels and electricity
  - Natural gas? Possibly due to CompNet's energy cost of energy production and consumption – natural gas potentially an intermediate input too

Impact of energy shocks: positive and negative shocks

VARIABLES	(1) Profitability	(2) Job destruction rate	(3) Energy cost share	(4) Energy / VA	(5) Export share	(6) Investment / asset	(7) Green share
weigh. Δ PC:							
Fossil fuels							
price decreases	0.137	-0.350	-0.003	-0.316	0.791*	-235.558	0.003
	(0.152)	(0.314)	(0.058)	(0.212)	(0.478)	(263.304)	(0.091)
price increases	-0.195**	0.221	0.196**	-0.045	0.013	151.592	-0.000
	(0.097)	(0.199)	(0.093)	(0.043)	(0.414)	(143.047)	(0.064)
Electricity							
price decreases	0.031	-0.177**	0.005	0.011*	-0.033	1.941	-0.062
	(0.039)	(0.068)	(0.006)	(0.006)	(0.090)	(17.657)	(0.050)
price increases	-0.043**	0.022	0.010***	0.002	-0.002	-45.661	-0.030
	(0.018)	(0.046)	(0.003)	(0.002)	(0.028)	(44.660)	(0.030)
Natural gas							
price decreases	-0.017	0.379***	-0.008	-0.022	0.126	145.272	-0.281***
	(0.061)	(0.114)	(0.012)	(0.020)	(0.092)	(141.672)	(0.105)
price increases	-0.225**	-0.145**	-0.022	0.008	-0.573***	167.120	0.071
	(0.088)	(0.069)	(0.016)	(0.020)	(0.147)	(167.341)	(0.071)
Constant	-0.029***	0.114***	-0.016***	-0.001	0.007	8.520	-0.000
	(0.009)	(0.024)	(0.004)	(0.002)	(0.023)	(9.525)	(0.004)
Observations	1,978	2,054	2,036	2,046	1,170	1,433	2,058
R-squared	0.462	0.354	0.292	0.039	0.156	0.046	0.046
Number of ID	253	254	254	253	142	188	254
Year FE	YES	YES	YES	YES	YES	YES	YES

Results are from a fe-panel regression at the country-industry level. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Clustered std. errors at the country-industry level. Omitted coefficients for control variables: profitability, revenues, firm size (employment), number of firms, average markup on intermediate inputs, average industry energy intensity. Results based on 20e weighted sample, countries included: DK, DE, FI, HR, LT, PL, PT, SI, SK. Industries included: 10, 13, 14, 17, 18, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 42, 45, 46, 47, 60, 61, 70, 78, 80, 81, 82. Dependent variables are in first differences.

Main regression results 4: macro-sector heterogeneity

- Inconclusive

Impact of energy shocks: macro-sector heterogeneity

	Profitability		Job destruction rate		Energy cost share		Energy efficiency	
VARIABLES	(1) Manuf & Constr	(2) Services	(3) Manuf & Constr	(4) Services	(5) Manuf & Constr	(6) Services	(7) Manuf & Constr	(8) Services
weigh. Δ PC:								
Fossil fuels	0.135	-0.031	-0.352*	-0.083	0.058**	0.147	0.108*	-0.247*
	(0.203)	(0.050)	(0.206)	(0.134)	(0.025)	(0.097)	(0.058)	(0.126)
Electricity	-0.041*	-0.018	0.027	-0.119**	0.013***	0.003	-0.002	-0.004
	(0.023)	(0.015)	(0.037)	(0.053)	(0.003)	(0.005)	(0.002)	(0.010)
Natural gas	-0.147**	-0.108**	0.069	0.213**	-0.021***	-0.002	-0.013	-0.040
	(0.058)	(0.045)	(0.063)	(0.103)	(0.006)	(0.026)	(0.008)	(0.028)
Constant	-0.050**	-0.028***	0.072**	0.148***	-0.016***	-0.016***	-0.002	0.000
	(0.020)	(0.009)	(0.031)	(0.035)	(0.003)	(0.005)	(0.003)	(0.008)
Observations	1,211	767	1,234	820	1,222	814	1,229	817
R-squared	0.474	0.455	0.447	0.293	0.503	0.246	0.011	0.121
Number of ID	150	103	150	104	150	104	150	103
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Results are from a fe-panel regression at the country-industry level. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Clustered std. errors at the country-industry level. Omitted coefficients for control variables: profitability, revenues, firm size (employment), number of firms, average markup on intermediate inputs, average industry energy intensity. Results based on 20e weighted sample, countries included: DK, DE, FI, HR, LT, PL, PT, SI, SK. Industries included: 10, 13, 14, 17, 18, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 42, 60, 61, 70, 78, 80, 81, 82. Dependent variables are in first differences.