ESTIMATING THE RISE IN EXPECTED INFLATION FROM HIGHER ENERGY PRICES

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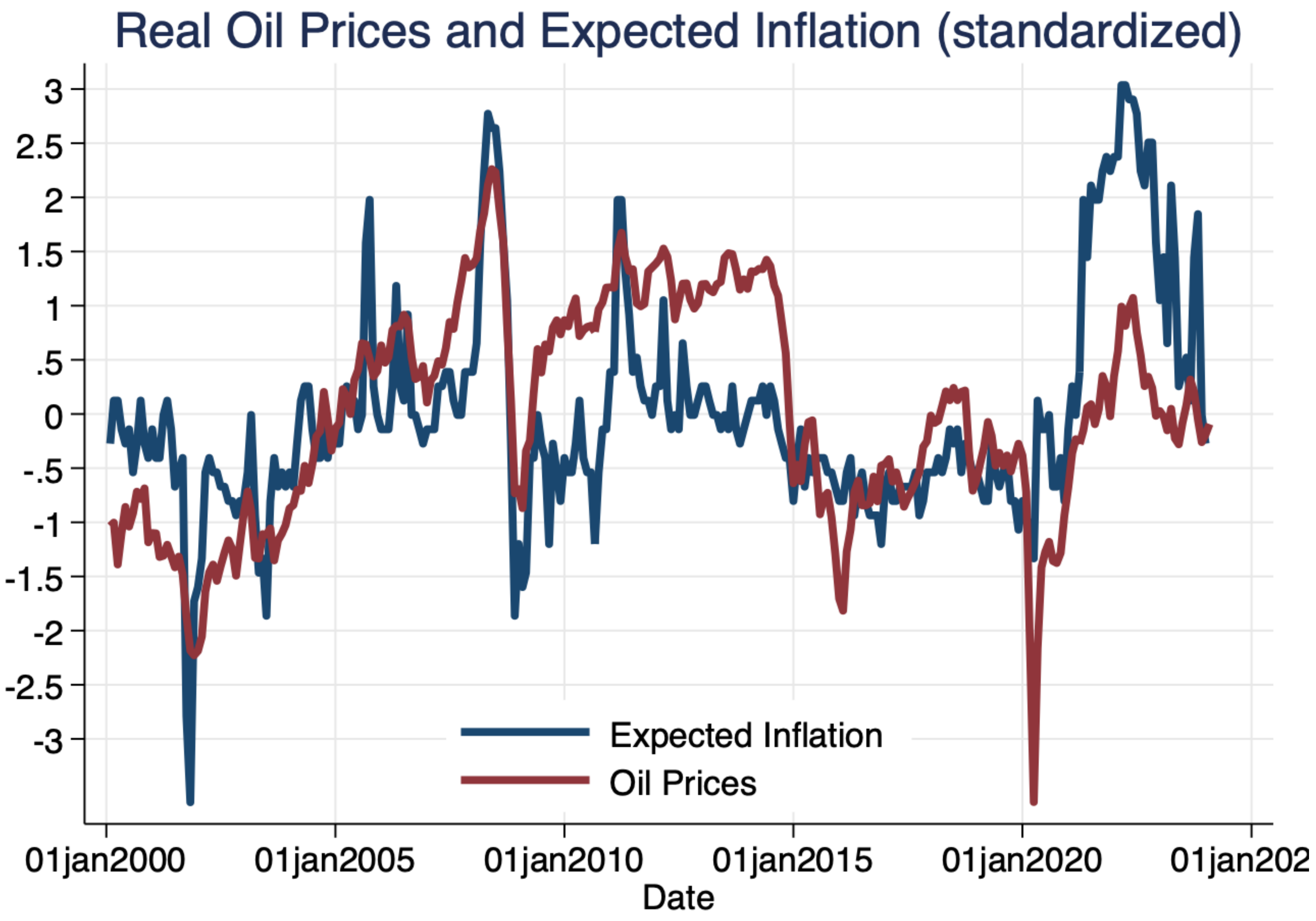
Link energy prices to inflation expectations



Strong correlation, sometimes used to dismiss expectations data, or to see through it.

All the econometric sins

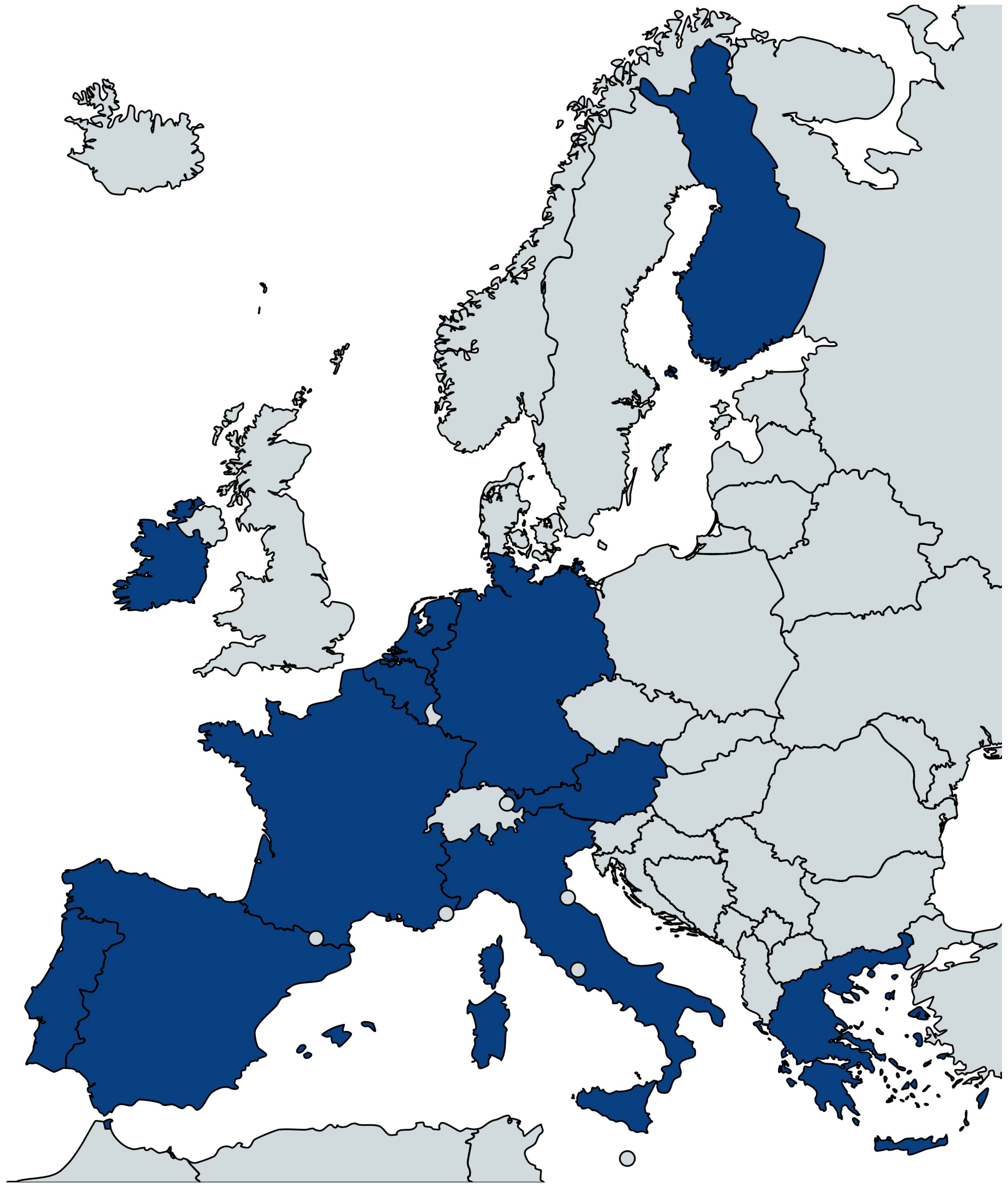
(i) Integration order

(ii) Demand and supply

(iii) Omitted variable

(iv) Correlation

Use cross-regional variation in monetary union



Consumer expectations survey

- 9,000-22,000 respondents, 2020:4-2023:12, 11 countries, expected inflation 12 months ahead

Electricity prices per country

- 25% of energy consumption, much variation

Market for electricity

- Different country basket weights of energy
- Exogenous oil price supply shocks
- Exogenous wind variation

Empirical specification

$$\Delta^6 \pi^e_{i,c,g,t} = \beta \Delta^6 e_{c,t} + \gamma \Delta^6 e_{c,t} \times \Delta^6 a_{c,g,t} + \alpha_c + \eta_g + \theta \bar{\pi}_{c,t-6} + \varepsilon_{i,c,g,t},$$

- $\pi^e_{i,c,g,t}$ expected inflation person i, country c, group g, month t
- $a_{c,g,t}$: how unanchored are expectations (disagreement in 3-year expectation)
- Δ^6 since large region-group fixed effects, less noise
- $\alpha_c + \eta_g + \theta \bar{\pi}_{c,t-6}$ as country and group systematic experiences
- β: *by how much does expected inflation over the next year increase on average when energy prices rise by 1%?*
- γ: *by how much more does the 1% rise in energy prices increase inflation expectations when those expectations are less well anchored?*

Table 1: The impact of electricity prices on expected inflation

Revision of expectation	(1)	(2)	(3)	(4)	(5)	(6)
Change in electricity prices	1.163***	0.961***	0.983***	1.304***	1.154***	0.372**
	(0.305)	(0.107)	(0.243)	(0.342)	(0.304)	(0.181)
Change in electricity prices × Unanchoring	0.669***	0.220***	2.695***	1.613***	0.692***	0.146
	(0.192)	(0.063)	(0.533)	(0.434)	(0.194)	(0.089)
Average past inflation	-0.097***	-0.103***	-0.104***	-0.092***	-0.096***	0.004
	(0.026)	(0.008)	(0.024)	(0.025)	(0.026)	(0.079)
Observations	362756	2472	362756	362756	362756	362756
R^2	0.013	0.285	0.015	0.014	0.014	0.032
Country & group fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Month fixed effects	No	No	No	No	No	Yes
Country-group fixed effects	No	No	No	No	Yes	No

Note: This table presents estimates of the regression in equation (1): $\Delta^6 \pi^e_{i,c,g,t} = \beta \Delta^6 e_{c,t} + \gamma \Delta^6 e_{c,t} \times \Delta^6 a_{c,g,t} + \alpha_c + \eta_g + \theta \bar{\pi}_{c,t-6} + \varepsilon_{i,c,g,t}$. Column (1) has the baseline estimates, (2) uses the average $\pi^e_{c,g,t}$ as the dependent variable, (3) uses as measure of unanchoring the deviation of long-run expected inflation from target, (4) uses anchoring at the country level only $a_{c,t}$, (5) includes country-group fixed effects, and (6) includes time fixed effects. In parentheses are standard errors clustered by month for the regressions using individual expectations.

Impact of a 1-StDev shock to energy prices

Table 2: The impact of energy shocks on expected inflation

Revision of expectation	(1)	(2)	(3)	(4)	(5)
Energy price shock	0.145**	0.580***	0.348***	-0.086	0.607**
	(0.057)	(0.081)	(0.101)	(0.100)	(0.262)
Energy price shock	0.267***	0.159***	0.006	0.025	0.115**
× Unanchoring	(0.033)	(0.037)	(0.067)	(0.079)	(0.053)
Average past inflation	-0.103***	-0.017	-0.111**	-0.132***	-0.041
	(0.023)	(0.025)	(0.041)	(0.029)	(0.167)
Observations	362756	362756	305037	362224	197950
R^2	0.017	0.024	0.015	0.010	0.027

Note: This table presents estimates of the regression equation $\Delta^h \pi^e_{i,c,g,t} = \beta \Delta^h z_{c,t} + \gamma \Delta^h z_{c,t} \times \Delta^h a_{c,g,t} + \alpha_c + \eta_g + \theta \bar{\pi}_{c,t-6} + \varepsilon_{i,c,g,t}$ where the first four columns use different measures of $z_{c,t}$. The energy shocks are, in order: the change in HICP electricity prices by country, the h-month change in EA-side HICP electricity times country-specific electricity expenditure weights in 2019, OPEC supply shocks to oil prices cumulated over h months times country-specific expenditure weights in 2019, and the h-month change in wind-source electricity generation. The first four columns set $h = 6$, while the fifth column uses the oil shocks with $h = 12$. In parentheses are standard errors clustered by month.

Dynamic effect

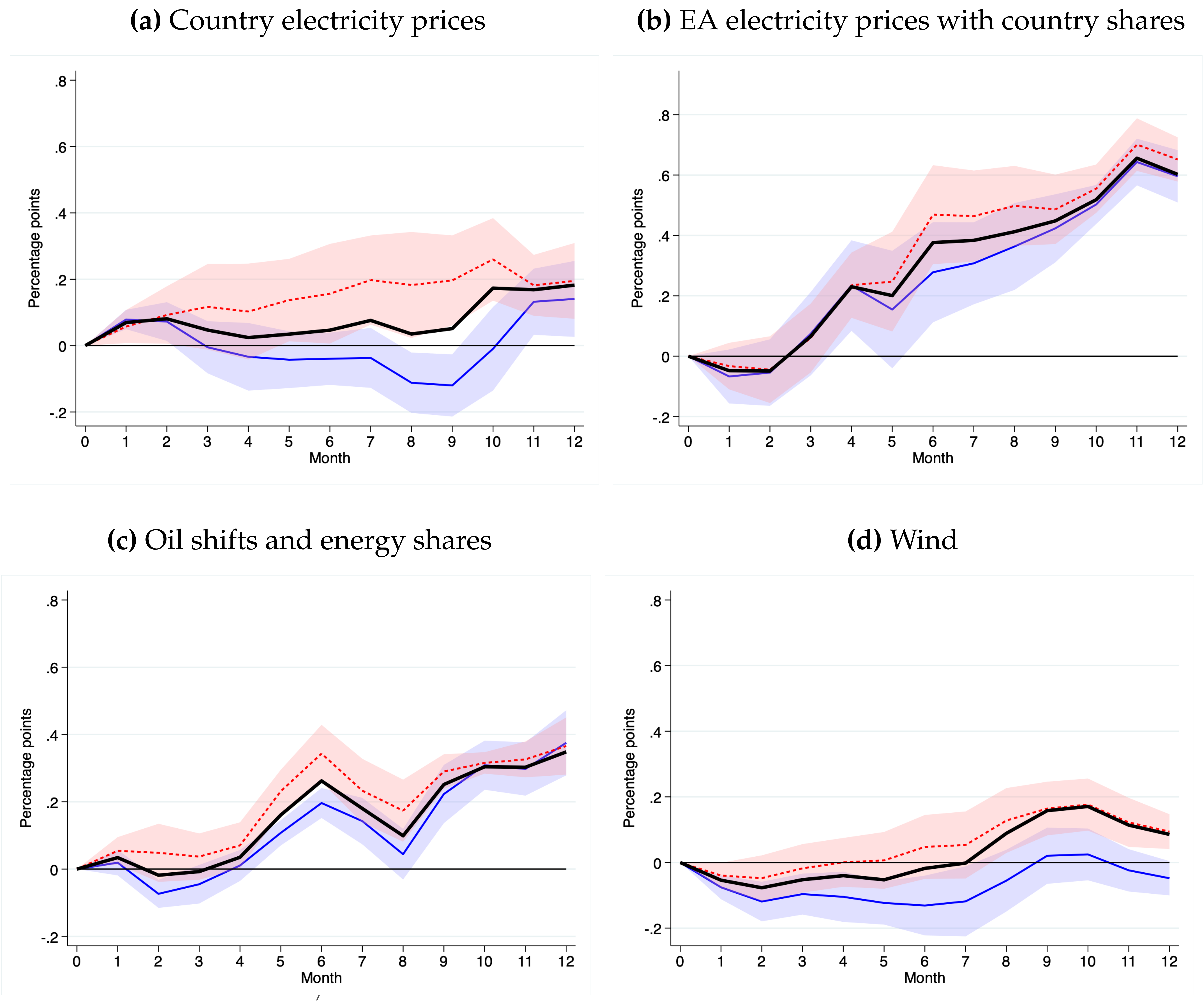
Local projection, anchoring above or below average, same fixed effects and controls

(a) $e_{c,t}$

(b) $e_t \times s_{c,19}$

(c) $k_t \times s_{c,19}$

(d) $w_{c,t}$



How much of the increase in expected inflation in 2021-22 was due to higher energy prices?

Between May 21 and May 22, according to fitted values of the equation:

0.53 pp (2.9 in data)

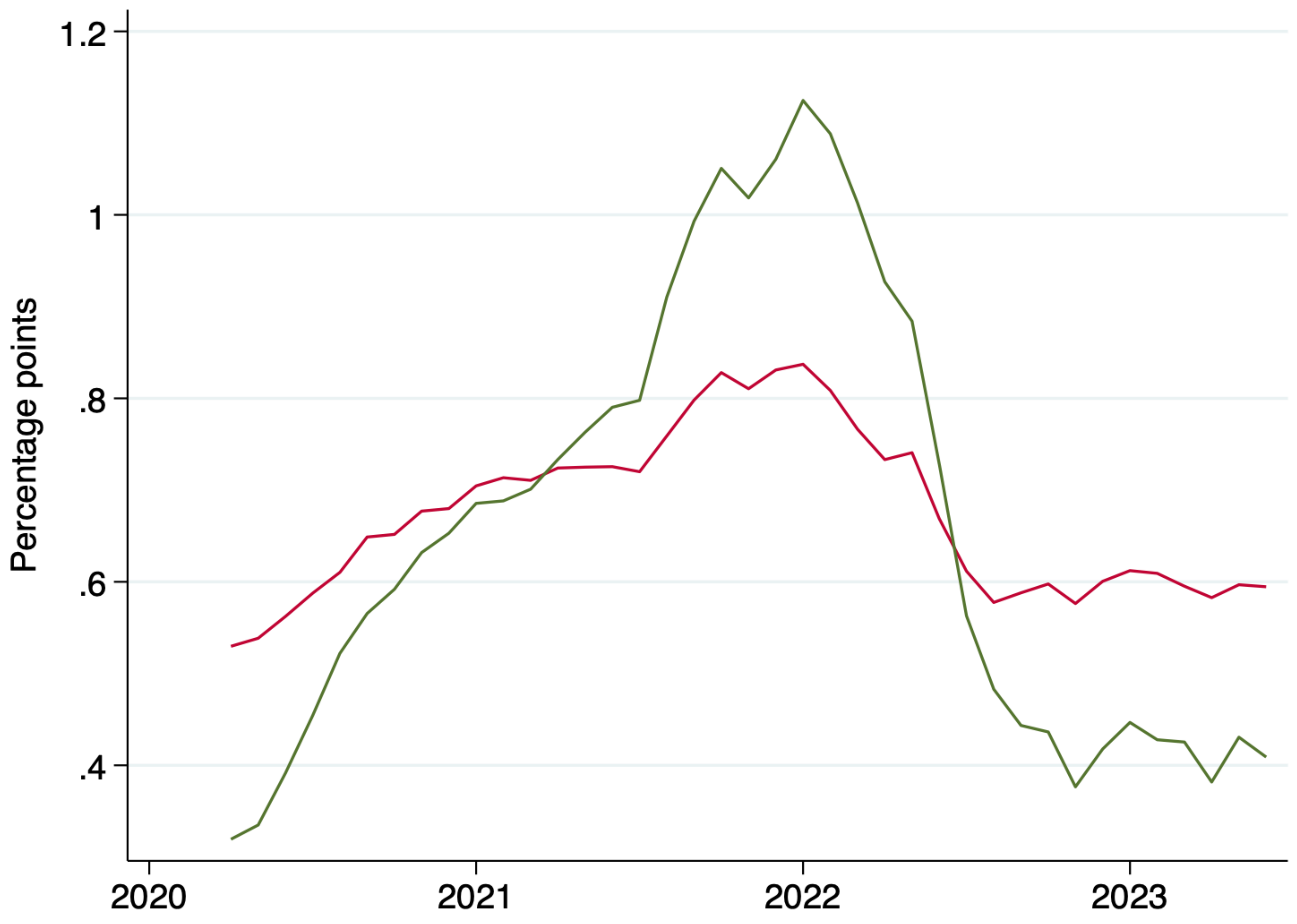
Partial R^2 from energy prices is:

0.39

Very little

How sensitive was expected inflation to electricity prices during the sample?

Figure 2: The time-varying impact of electricity prices on expected inflation



Note: The figure plots the predicted effect on EA average expected inflation from doubling electricity prices over the following 6 months, calculated as a function of the extent of unanchoring over the same period, using the coefficients estimated in column 1 of table 1. In red are estimates using disagreement about long-run expected inflation as a measure of unanchoring, and in green are those using the absolute difference between expected long-run inflation and target.

How large are estimates and inattention?

- Estimate equations with actual (headline) inflation: coefficient is 6.5 times higher. Expected inflation responds significantly less than actual inflation to energy.
- Rational inattention result (second order approximation):

$$\frac{\partial \pi^e}{\partial e} = \left(\frac{v(e)}{2\lambda} \right) a^2(e) \, .$$

- When expectations are very sensitive to shocks, then the mistakes in forming those expectations must not be so costly. Therefore, she is less attentive, and so there is more unanchoring.
- Energy shocks generate endogenous attention wedges that will appear as markup shocks in a Phillips curve.

Conclusions

Used (i) cross-regional variation within a currency union, (ii) recently-released large household survey of expectations in the EA allowing for groups, (iii) the large variability in energy prices in the 2020-23 period, (iv) features of electricity markets, to find that:

(1) Price of electricity increases by 1%, expected inflation increases by 1.0 to 1.3bp

(2) If unanchored expectations, the effect is higher by 0.2 to 1.6bp

(3) The impact of exogenous shocks rises for 8 to 12 months,

(4) Energy shocks of 2021-23 explain a small share of the rise in expected inflation.

(5) Reanchoring in 2023 prevented flare up during Fall of 2023?

(6) Relative price supply shocks partly driven by expectations?