Monetary Policy Announcements and Expectations: Evidence from German Firms

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The question

Do monetary policy announcements impact **firm expectations** and, if so, how?

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Study of (survey) expectations quickly expanding in recent years

- One reason: stronger focus on central bank communication and the management of expectations
- Empirical studies mainly on professional forecasters and households

We focus on actual price setters' expectations of own prices and production

This paper

Consider effects of non-conventional and conventional monetary policy announcements on firm expectations

Unique data set: Ifo Business Survey Industry (IBS)

- Large monthly panel of German firms, 2004 – 2018

Data on

- expectations regarding own production and prices 3 months ahead
- many firm-specific variables
- *day of response* for each firm

Our results

Monetary policy announcement affect firms' price and production expectations *non-linearly*

- Large policy actions have smaller effects than small actions

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Interpretation: attention to *information content* of announcement endogenous to the size of the surprise

- Central bank better informed than agents (Romer&Romer 2000)
- Monetary policy has 'information effect' in addition to standard effects (Melosi 2017, Nakamura&Steinsson 2018)
- Cannot be explained by direct measures of communication/information (Jarociński&Karadi 2019)

Further literature

Coibion & Gorodnichenko (2012, 2015): professional forecasters adjust forecasts only sluggishly

Coibion et al. (2015, 2018a): behavior of price setters

Coibion et al. (2018b): effect of firm expectations on decisions

Bachmann & Elstner (2015, ifo survey): up to 1/3 of firms systematically over- or underpredict production growth

Bachmann & Zorn (2018, ifo investment survey): subjective determinants, including expectations, drive investment decisions

Balleer & Zorn (2019): effects of monetary policy on firms' price setting

Enders et al. (2019, ifo surey): effect of firm exp. on decisions

Data

Expectations data

Ifo Business Survey Industry

- Provided by the LMU-ifo Economics and Business Data Center (EBDC)
- Micro data available since the 1980s
- Our sample: manufacturing sector, 2004 – 2018
- Unit of observation is 'plant' or business area of a firm
- In total 400,000 observations (2500 firms per month)
- For 220,000 observations (1500 per month) day of response recorded (requires survey to be answered online)

→ Sample over time

→ Descriptive statistics

Survey questions

Expectations regarding prices

> "Expectations for the next 3 months:
> Taking changes of terms and conditions into account, our domestic sales prices (net) for product XY will probably increase [1], not change [0], decrease [-1]."

Expectations regarding production

> "Expectations for the next 3 months:
> Our domestic production activity regarding good XY will probably increase [1], not change [0], decrease [-1]."

→ Time series

→ Leading indictator

Monetary policy events

Euro Area Monetary Policy Event Study Database (EA-MPD) compiled by Altavilla et al. (2019)

- High-frequency changes in OIS rates (inter alia) around monetary policy events
- Monetary-event window covering both press conference and press release

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Jarociński-Karadi (2019) monetary policy shocks

- Based on high-frequency changes in interest rates and stock market around ECB meetings and important speeches
- Use VAR with sign restrictions to separate 'pure' monetary policy shocks from central bank information shocks

Non-conventional monetary policy announcements

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Identify effects of non-conventional announcements by the ECB on price and production expectations

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We largely follow Del Negro et al. (2015), but . . .

- . . . analyze firm expectations instead of forecasters
- . . . know the day of the response: focus on narrow window around announcement, less need for macro controls

Pool observations between January 2009 and June 2018

→ List of events (Dedola et al. 2018)

Empirical approach

$$\Delta f(y)_{i,t} = \alpha + \sum_m \beta_m D_{i,m} + \delta_1 f(y)_{i,t-1} + \delta_2 Z_{i,t-1} + u_{i,t}$$

- $f(y)_{i,t}$: expectation of firm i regarding y in next 3 months, reported in month t
- $\Delta f(y)_{i,t}$: change of expectations relative to previous month
- $Z_{i,t-1}$: lagged controls (prices, production, demand, (foreign) orders, capacity utilization, and average state of business)
- $D_{i,m} = 1$ if response within two working days after announcement m
- $D_{i,m} = 0$ if response within two working days before announcement m, or if no announcement in month

→ Controls
→ Questions

Effects of non-conventional announcements

	Dependent variable: change in the expectations for prices			production		
12-month LTROs	-0.156***	-0.101***	-0.005	-0.140***	-0.066	-0.056
	(0.032)	(0.031)	(0.038)	(0.041)	(0.041)	(0.051)
6-month LTROs	-0.036	-0.034	-0.043	-0.046	-0.015	-0.025
	(0.027)	(0.026)	(0.031)	(0.036)	(0.035)	(0.041)
12/13-month LTROs	-0.029	-0.064**	-0.041	-0.136***	-0.153***	-0.080*
	(0.026)	(0.025)	(0.028)	(0.038)	(0.040)	(0.044)
36-month LTROs	0.070**	0.086**	0.056	-0.003	0.027	0.070
	(0.035)	(0.035)	(0.046)	(0.042)	(0.040)	(0.056)
OMT details	-0.054**	-0.038	-0.034	-0.192***	-0.135***	-0.123***
	(0.026)	(0.026)	(0.029)	(0.039)	(0.040)	(0.044)
Forward Guidance	-0.030**	-0.019		-0.005	0.001	
	(0.013)	(0.012)		(0.019)	(0.018)	
TLTROs	-0.070	-0.055	-0.023	-0.042	0.010	0.048
	(0.052)	(0.052)	(0.056)	(0.067)	(0.069)	(0.074)
ABSPP+CBPP3	-0.011	-0.006		-0.036*	0.008	
	(0.013)	(0.013)		(0.021)	(0.021)	
APP details	0.006	-0.003		0.028	0.030	
	(0.020)	(0.020)		(0.026)	(0.027)	
PSPP share limit	-0.027	-0.019		0.064**	0.101***	
	(0.017)	(0.017)		(0.031)	(0.033)	
APP end	0.034	0.028	-0.006	-0.013	-0.011	-0.055
	(0.028)	(0.033)	(0.048)	(0.043)	(0.045)	(0.067)
Expectation, t-1	X	X	X	X	X	X
Further Controls		X	X		X	X
Monthly time fixed effects			X			X
Observations	236635	201212	201212	230028	197239	197239
Adjusted R^2	0.22	0.29	0.29	0.25	0.32	0.33

Effects of non-conventional announcements vary

Not many announcements had a significant effect on firms expectations

Despite announcements being easing, expectations fell
$\rightarrow$ in line with other studies of non-conventional announcements

$\Rightarrow$ To understand results, turn to more systematic analysis using broader measure of monetary policy shocks

Monetary policy surprises

Linear Effects

We now use full sample, July 2004 to June 2018

- EA-MPD features 155 monetary surprises in this period, we match 136

→ Response days

- Again use window ± 2 working days around event
  → Most events on Thursday: Window from Tuesday before to Monday after (excluding event day)

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Similar specification as before

$$\Delta f(y)_{i,t} = \alpha + \beta D_{i,m} \varepsilon_m + \delta_1 f(y)_{i,t-1} + \delta_2 Z_{i,t-1} + u_{i,t}$$

- $D_{i,m}$ dummy variable indicating whether firm answered within two working days of event
- ε_m: monetary surprise (Δ1-month OIS in event window)
- Other variables as before

Linear effects

	Dependent variable: change in the expectations for			
	prices		production	
OIS, 1-month	0.0008	**0.0012***	0.0017*	**0.0001**
	(0.001)	(0.001)	(0.001)	(0.001)
Expected prices, t-1	-0.4540***	-0.5777***		
	(0.004)	(0.006)		
Expected production, t-1			-0.4950***	-0.6223***
			(0.004)	(0.005)
Average state of business, t-1	0.1338***	0.0771***	0.1322***	0.0912***
	(0.008)	(0.009)	(0.011)	(0.012)
Further controls		X		X
Observations	65003	58779	62968	57379
Adjusted R^2	0.23	0.28	0.24	0.33
Observations before	31978	28761	30960	28058
Observations after	33025	30018	32008	29321

Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

→ Controls

→ Questions

Expansionary monetary policy announcements *decrease* price expectations (if significant)

Nonlinear Effects

Counterintuitive result, like for non-conventional announcements

- But those were large (avg. $|\Delta 1\text{MOIS}|$ double than normal)

→ Surprises

Nonlinear Effects

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- But those were large (avg. $|\Delta 1\text{MOIS}|$ double than normal)

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Large shocks may bias the results if large surprises have different effects than small ones

Nonlinear Effects

Counterintuitive result, like for non-conventional announcements

- But those were large (avg. $|\Delta 1\text{MOIS}|$ double than normal)

→ Surprises

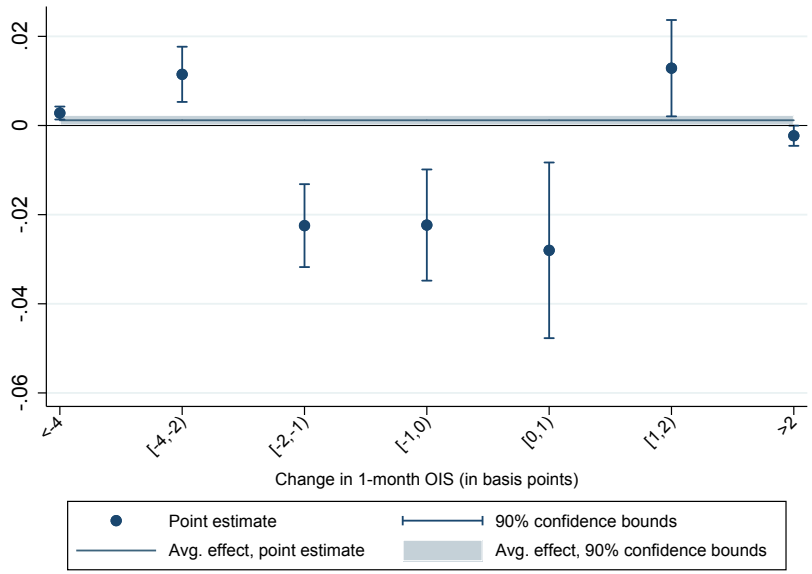
Large shocks may bias the results if large surprises have different effects than small ones

Explore non-linearity

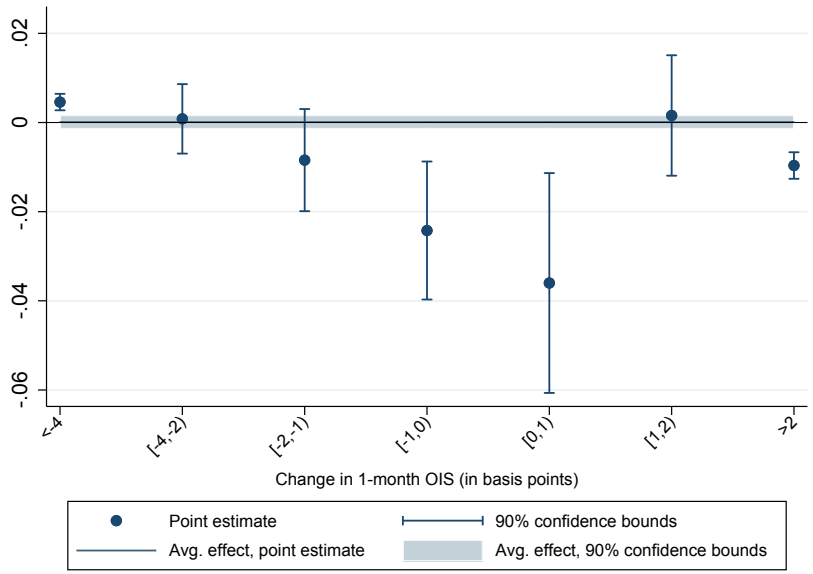
1. Semi-parametric: sort surprises by size into 7 bins, allowing for different effects → Distribution
2. Non-parametric: Kernels
3. Parametric: include cubed term in regression

Nonlinear effects on expectations: bins

Price expectations

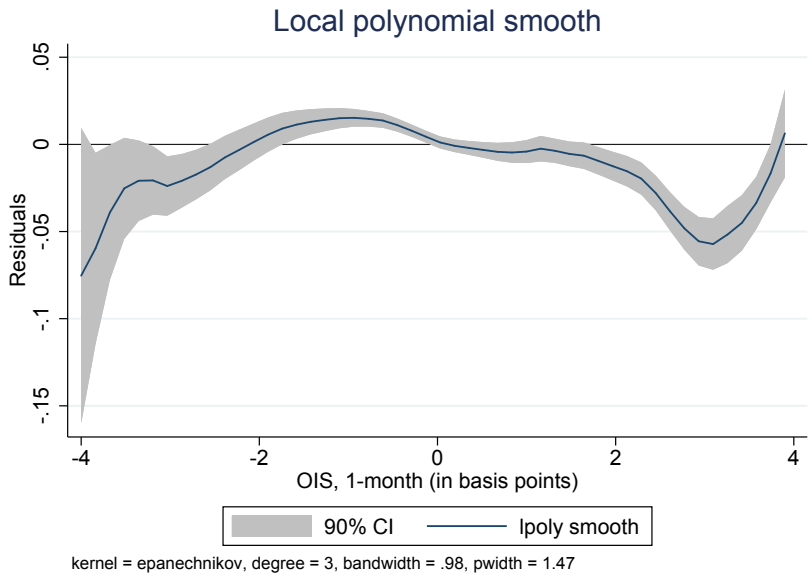


Production expectations

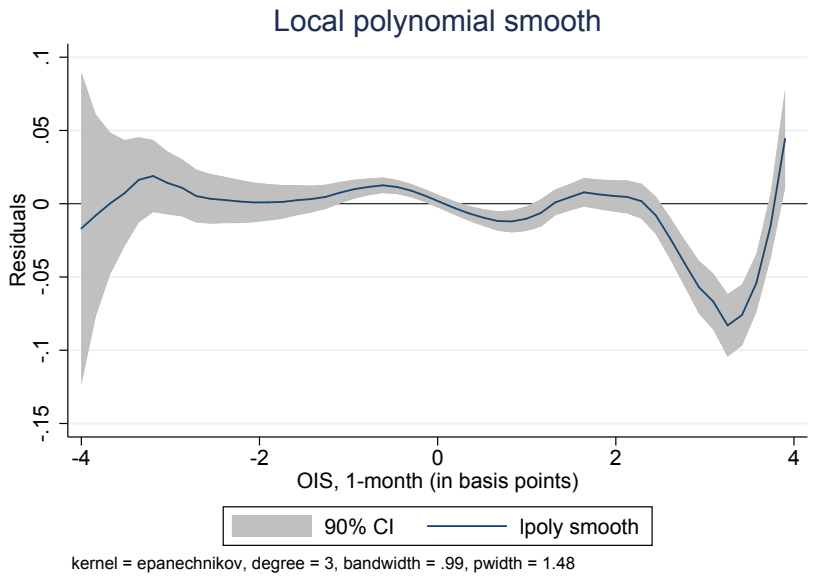


Nonlinear effects on expectations: kernels

Price expecations



Production expecations



Cubic term

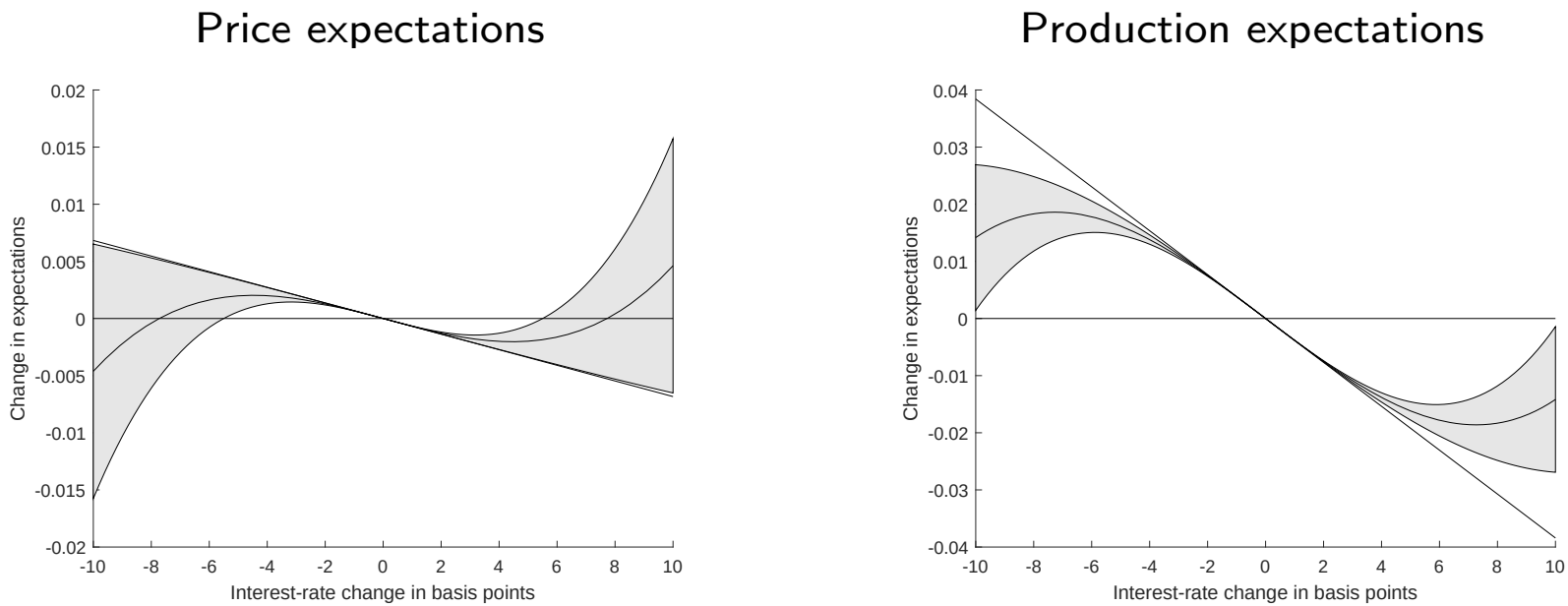
	Dependent variable: change in the expectations for prices			production		
OIS, 1-month	-0.0005	**-0.0007**	-0.0035**	-0.0018	**-0.0038****	-0.0039*
	(0.001)	(0.001)	(0.0017)	(0.002)	(0.0015)	(0.002)
OIS, 1-month, cubic	0.074	**0.114***	1.024***	0.210***	**0.242*****	1.005***
(coeff. & s.e. $\times 10^{-4}$)	(0.065)	(0.067)	(0.273)	(0.078)	(0.077)	(0.371)
Expected prices, t-1	-0.454***	-0.577***	-0.576***			
	(0.004)	(0.006)	(0.006)			
Expected production, t-1				-0.495***	-0.622***	-0.622***
				(0.004)	(0.005)	(0.005)
Average state of business, t-1	0.135***	0.078***	0.083***	0.134***	0.094***	0.095***
	(0.009)	(0.009)	(0.009)	(0.011)	(0.012)	(0.013)
Further controls		X	X		X	X
Observations	65003	58779	56491	62968	57379	55155
Adjusted R^2	0.23	0.28	0.28	0.24	0.33	0.33
Observ. before	31978	28761	27395	30960	28058	26731
Observ. after	33025	30018	29096	32008	29321	28424
Excl. largest OIS changes			X			X

Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

→ Controls

→ Questions

Cubic term



Straight line: estimate of linear term. Shaded area: 90% confidence interval around cubic component. Horizontal axis: interest rate surprise (bp); vertical axis: change in expectations.

Significant evidence for smaller effects of large announcements.
$\rightarrow$ In line with 'information effect': large expansionary policy surprises carry bad news (or trigger reassessment of expectations)

The role of the qualitative dependent variables

	Dependent variable: change in expectations for			
	prices, neutral in t-1	production, neutral in t-1	state of business, qual. measure	state of business, scale measure
OIS, 1-month	-0.0009	-0.002	-0.004***	-0.081**
	(0.001)	(0.002)	(0.0016)	(0.033)
OIS, 1-month, cubic	0.172***	0.149*	0.395***	4.042**
(coeff. & s.e. $\times 10^{-4}$)	(0.057)	(0.082)	(0.080)	(1.942)
Further Controls	X	X	X	X
Observations	45258	37627	56989	52905
Adjusted R^2	0.10	0.12	0.31	0.17
Observations before	22209	18247	27916	27139
Observations after	23049	19380	29073	25766

Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Further robustness

We also check whether our results are robust to

- using different window sizes
- controlling for the financial crisis period
- controlling for aggregate uncertainty in the economy
- including firm fixed effects
- clustering standard errors at the firm level

Effects are qualitatively similar in all cases for production and most cases for prices.

→ Prices

→ Production

Central bank information and communication

Central bank information shocks

What drives these non-linear responses?

Possible answer: when shocks are large, agents are more likely to see shock as also carrying information about the state of the economy

Alternative: central bank communication differs for large shocks

→ Analyze whether central bank information shock by Jarociński & Karadi (2019) can account for non-linearity

Central bank information shocks

	Dependent variable: change in the expectations for			
	prices		production	
OIS, 1-month	-0.002	-0.003*	-0.005***	-0.002
	(0.001)	(0.0016)	(0.002)	(0.002)
OIS, 1-month, cubic	0.137**	0.157**	0.261***	0.226***
(coeff. & s.e.$\times 10^{-4}$)	(0.069)	(0.071)	(0.079)	(0.082)
Central bank information shock	0.004*	0.006**	0.003	0.0005
	(0.002)	(0.003)	(0.003)	(0.003)
Monetary policy shock		0.004		-0.006*
		(0.003)		(0.004)
Controls	X	X	X	X
Observations	56109	56109	54754	54754
Adjusted R^2	0.28	0.28	0.33	0.33
Observations before	26706	26706	26046	26046
Observations after	29403	29403	28708	28708

Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Central bank communication

Central bank information shock cannot explain non-linearity

Use institutional set-up of ECB meetings to disentangle effects of interest-rate changes that are due to

- monetary policy shock as such (press-release window)
- central-bank communication (press-conference window)

$\Rightarrow$ Separately consider responses to surprise in press-release and press-conference window

Central bank communication

	Dependent variable: change in the expectations for prices		production	
	Release	Conference	Release	Conference
OIS, 1-month	-0.002	-0.007**	-0.007***	-0.0003
	(0.002)	(0.003)	(0.002)	(0.004)
OIS, 1-month, cubic	0.169**	2.980***	0.363***	1.110
(coeff. & s.e.$\times 10^{-4}$)	(0.077)	(0.881)	(0.088)	(1.139)
Controls	X	X	X	X
Observations	58779	58779	57379	57379
Adjusted R^2	0.28	0.28	0.33	0.33
Observations before	28761	28761	28058	28058
Observations after	30018	30018	29321	29321

Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Central bank communication

Non-linearity seems to stem from press release window

Firms perceive large surprises in the policy decision as such differently than small surprises

$\Rightarrow$ This does not seem to be due to effects from communication

$\Rightarrow$ Non-linearity embedded in monetary policy shock per se

Conclusion

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How do monetary policy announcements impact firm expectations?

- Evidence for non-linear effects of announcements
- Large announcements have smaller effects than small announcements
- Interpretation: only large shocks contain additional information/are perceived to contain additional information revealed by the central bank

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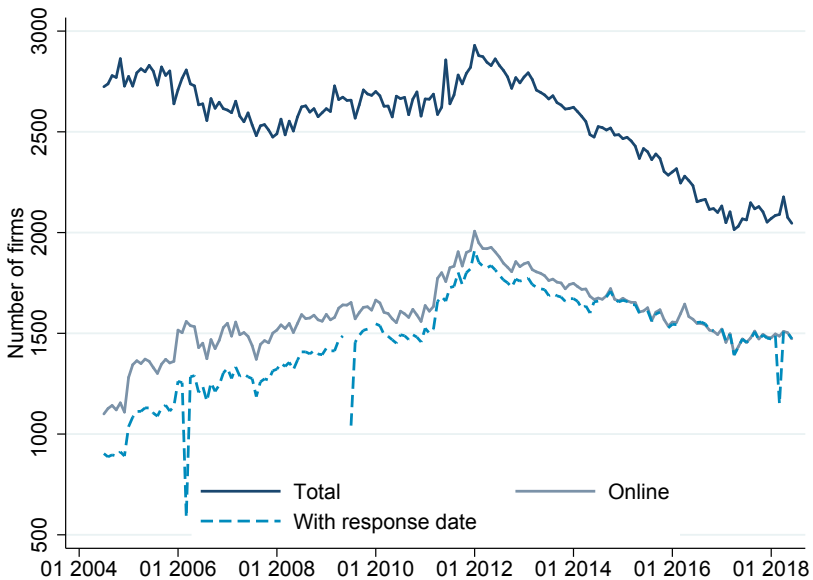
Implications

- Gradualism?
- Results call for further model-based analysis regarding optimal monetary policy (Jia 2019)

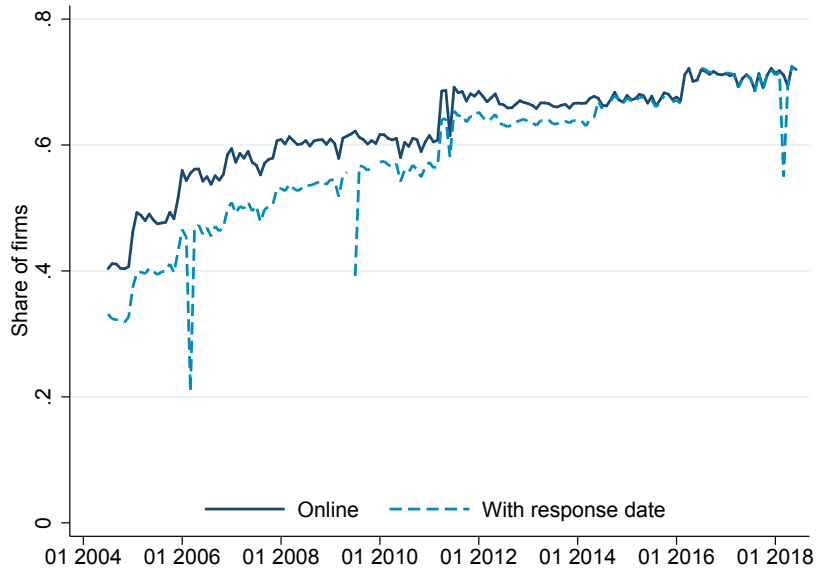
Appendix

The sample

Total number of firms



Share of firms responding online



Response dates are not available is the following months: 06-2009, 12-2009, 08-2014, 11-2015, 03-2016, 05-2016, 06-2016, and 12-2016.

→ back

Online sample vs. full sample

	Full sample			Sample with part. date		
	Mean	Std. Dev.	Obs.	Mean	Std. Dev.	Obs.
Employees	489	3563.26	428790	548	3771.49	232267
Expected production, t	0.04	0.57	414486	0.06	0.58	224473
Expected prices, t	0.08	0.47	426451	0.08	0.47	231031
Production, t-1	-0.00	0.58	413784	0.01	0.58	224232
Prices, t-1	0.03	0.44	426706	0.04	0.43	231021
Demand, t-1	0.02	0.65	428220	0.03	0.66	231851
Orders, t	-0.14	0.65	426175	-0.12	0.66	231498
Foreign orders, t	-0.16	0.58	422043	-0.14	0.60	229778
Capacity utilization, t	81.08	16.57	366987	81.63	16.19	208385
State of business, t	0.12	0.68	428291	0.15	0.69	231959
Exp. state of business, t	0.02	0.60	427022	0.02	0.60	231297
Exp. state of business (scale), t	52.47	16.46	243925	52.64	16.44	213926
Inventories, t	-0.11	0.48	294251	-0.09	0.48	159477

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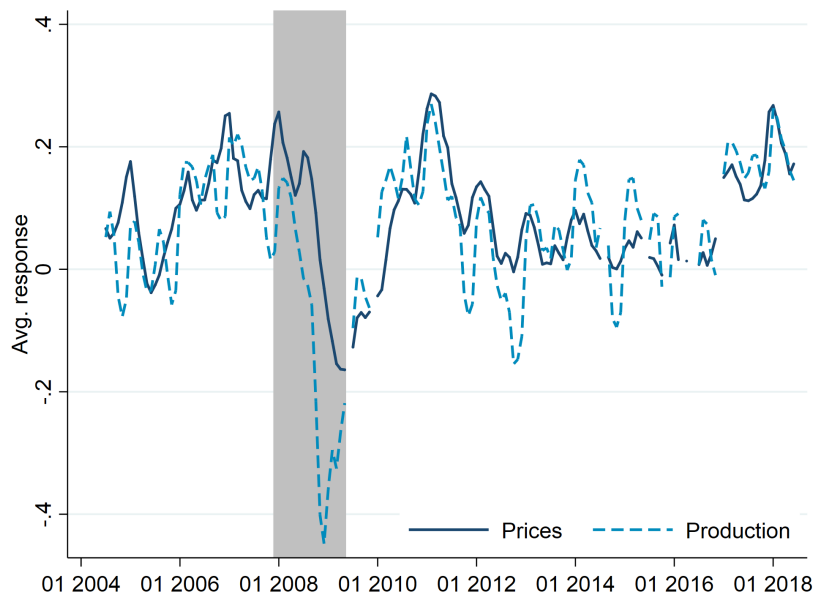
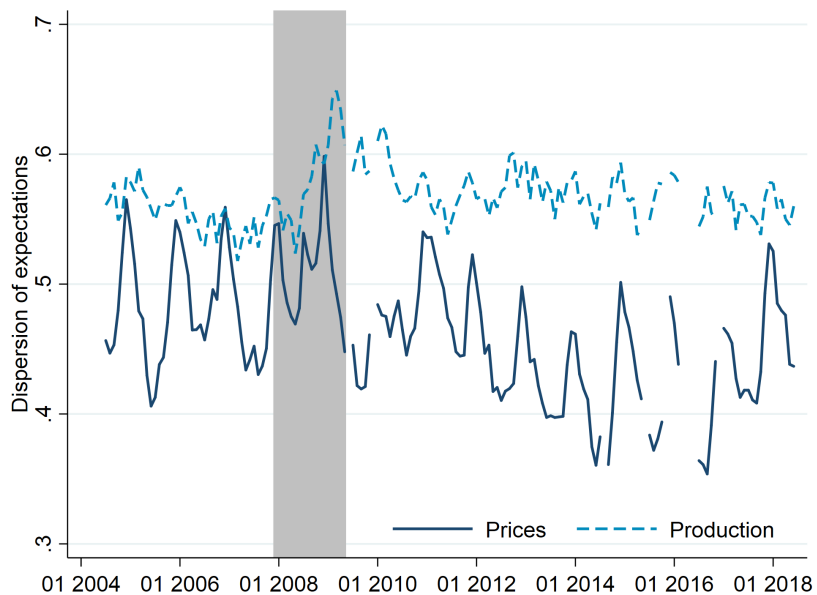
Expectations

Avg. expectations within months



Dispersion



Notes: Shaded areas mark recession periods as defined by the German Council of Economic Experts.

Price- and production expectations tend to co-move (exception: phase of 'missing disinflation')

Lower dispersion of price expectations compared to production

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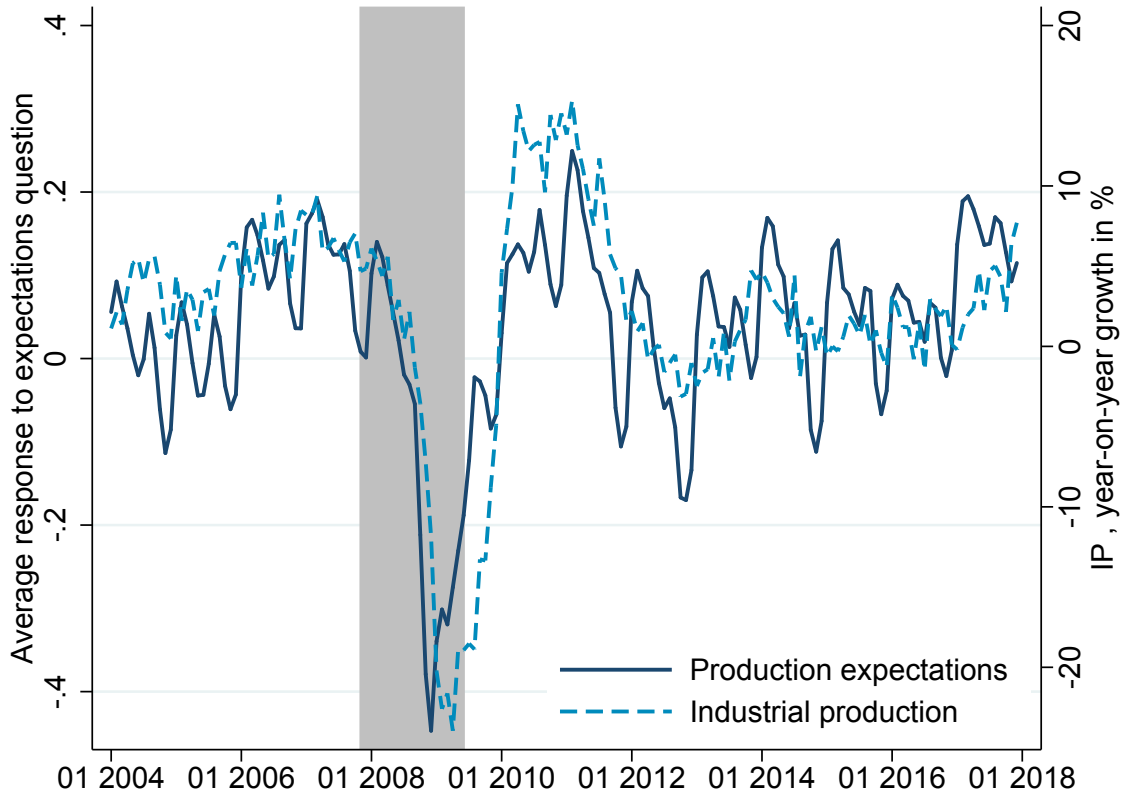
Expectations and aggregate realizations

Production expectations and Industrial Production



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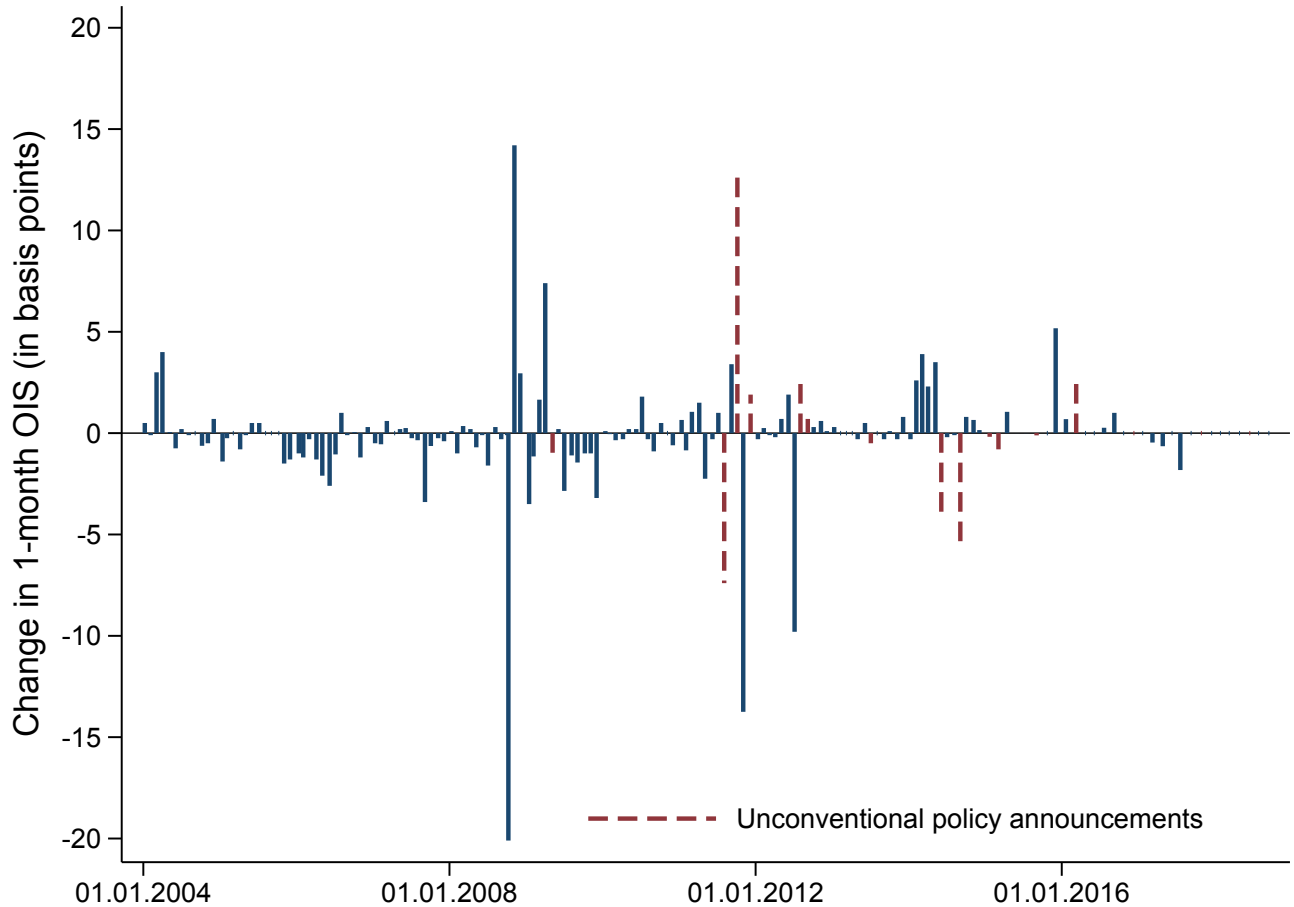
Monetary policy surprises, 2004-2018



90% of 1-month OIS changes less than 3 bp in absolute value

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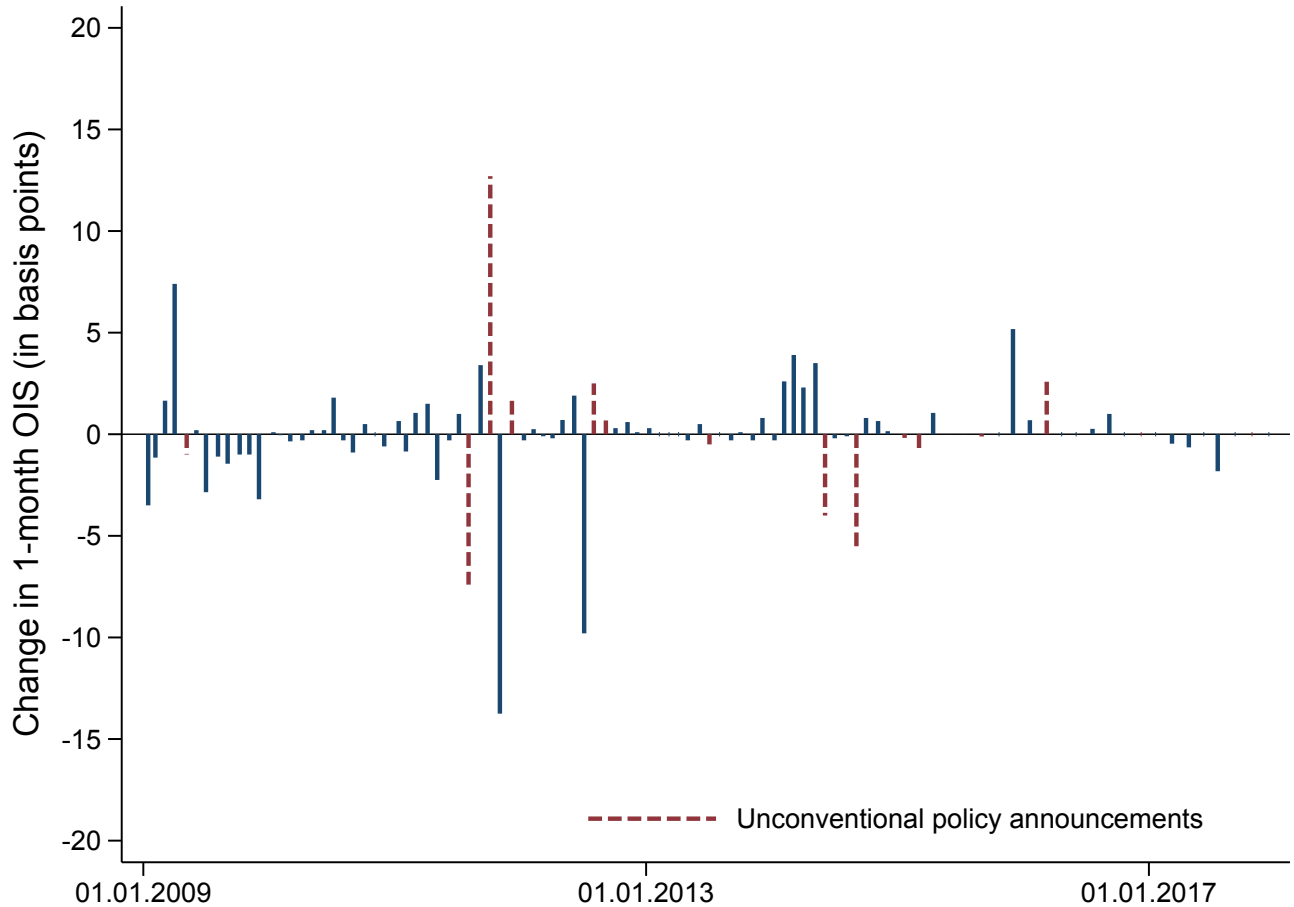
Monetary policy surprises, 2009-2018



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Non-conventional announcements

Date	Announcement
05/07/2009	12-months Longer-term Refinancing Operations (LTROs)+other measures
08/04/2011	6-months LTROs + other measures
10/06/2011	12 and 13-months LTROs
12/08/2011	36-months LTROs
08/02/2012	Announcement of the Outright Monetary Transactions (OMT) program
09/06/2012	OMT implementation details
07/04/2013	First forward guidance announcement
06/05/2014	Targeted Longer-term Refinancing Operations (TLTROs)
09/04/2014	Announcement of the Asset-backed Securities Purchase Program (ABSPP) and the new Covered Bonds Purchase Program (CBPP3)
01/22/2015	Announcement of the expanded Asset Purchase Program (APP)
03/05/2015	APP implementation details
09/03/2015	Increase in public sector purchase program (PSPP) share limit
03/10/2016	Announcement of Corporate Sector Purchase Program (CSPP)
12/08/2016	First extension of the APP
10/26/2017	Second extension of the APP
06/14/2018	Announcement of the end of the APP

Notes: Extended version of list provided by Dedola et al. (2018)

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Control variables

- Expected prices *t-1*
- Expected production *t-1*
- Average state of business *t-1*
- Prices *t-1*
- Prices *t-2*
- Production *t-1*
- Production *t-2*
- Demand *t-1*
- Demand *t-2*
- Orders *t-1*
- Foreign orders *t-1*
- Capacity utilization *t-1*

→ back non-conv.

→ back linear

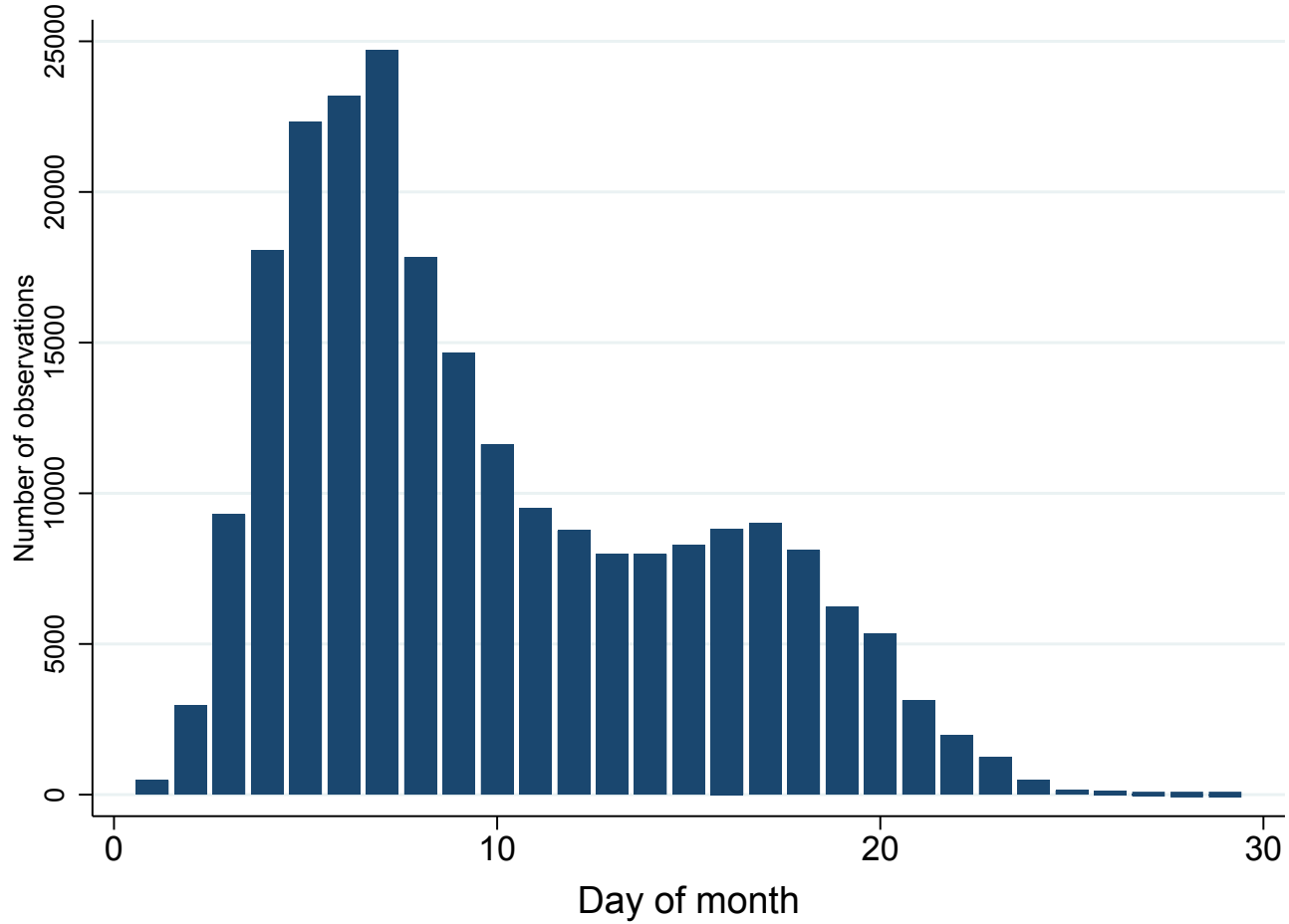
→ back nonlinear

Questions

Name	Question	Possible answers
Expected prices	Expectations for the next 3 months: Taking changes of terms and conditions into account, our domestic sales prices (net) for product XY will probably ...	increase [1] not change [0] decrease [-1]
Expected production	Expectations for the next 3 months: Our domestic production activity regarding good XY will probably ...	increase [1] not change [0] decrease [-1]
Prices	Tendencies in the previous month: Taking changes of terms and conditions into account, our domestic sales prices (net) for product XY have ...	increased [1] not changed [0] decreased [-1]
Production	Tendencies in the previous month: Our domestic production activities with respect to product XY have ...	increased [1] not changed [0] decreased [-1]
Demand	Tendencies in the previous month: The demand situation with respect to product XY was ...	better [1] not changed [0] worse [-1]
Orders	We consider our order backlog to be ...	relatively high [1] sufficient [0] too small [-1]
Foreign orders	We consider our order backlog for exports to be ...	relatively high [1] sufficient [0] too small [-1]
Capacity utilization	The current utilization of our capacities for producing XY (standard utilization = 100%) is currently x%.	x is a value between 30 and 100 divisible by 10
State of business	Current situation: We evaluate our state of business for XY to be...	good [1] satisfactory [0] bad [-1]
Expected state of business	Expectations for the next 6 months: Our state of business for XY will ...	improve [1] stay the same [0] worsen [-1]

→ back non-conv. → back linear → back nonlinear

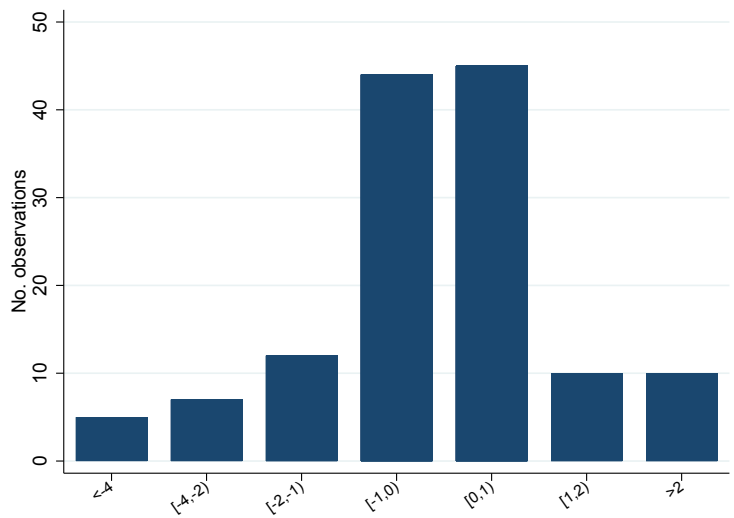
Response time within month



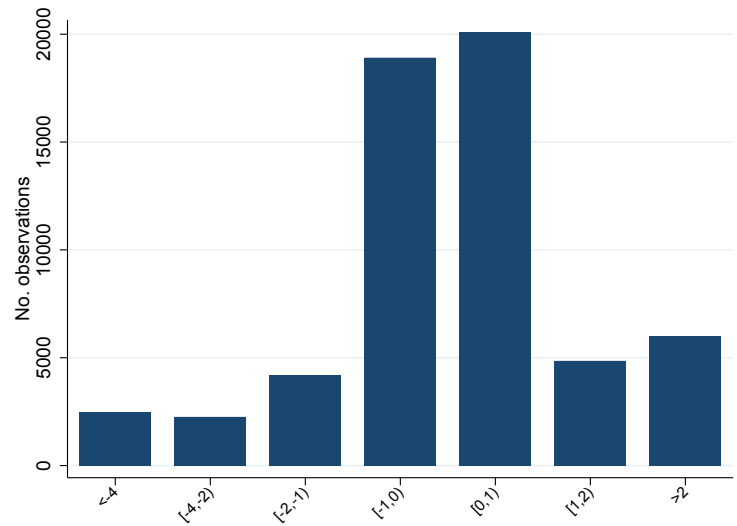
→ back

Monetary policy surprises: bins

Monetary policy events



Firm observations



→ back

Further robustness: price expectations

	Dependent variable: change in price expectations					
	8 w.day window	Full window	Crisis dummy	Uncertainty dummy	Firm fixed effects	Clustered std. errors
OIS, 1-month	-0.0008	-0.0016***	-0.0008	0.000004	-0.0006	-0.0007
	(0.001)	(0.0005)	(0.001)	(0.001)	(0.001)	(0.001)
OIS, 1-month, cubic	0.138**	0.080***	0.129	0.175*	0.100	0.114*
(coeff. s.e. $\times 10^{-4}$)	(0.067)	(0.021)	(0.085)	(0.090)	(0.069)	(0.067)
OIS, 1-month			-0.0006			
$\times$ crisis dummy			(0.002)			
OIS, 1-month				-0.002		
$\times$ uncertainty dummy				(0.002)		
Controls	X	X	X	X	X	X
Observations	72013	188211	58779	58779	58779	58779
Adjusted R^2	0.28	0.29	0.28	0.28	0.32	0.28
Observations before	41939		28761	28761	28761	28761
Observations after	30074		30018	30018	30018	30018

Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

→ back

Further robustness: production expectations

	Dependent variable: change in production expectations					
	8 w.day window	Full window	Crisis dummy	Uncertainty dummy	Firm fixed effects	Clustered std. errors
OIS, 1-month	-0.004**	-0.005***	-0.006***	-0.001	-0.004**	-0.004**
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
OIS, 1-month, cubic	0.224***	0.342***	0.506***	0.453***	0.237***	0.242***
(coeff. s.e. $\times 10^{-4}$)	(0.075)	(0.025)	(0.104)	(0.102)	(0.077)	(0.077)
OIS, 1-month $\times$ crisis dummy			-0.011***			
			(0.003)			
OIS, 1-month $\times$ uncertainty dummy				-0.008***		
				(0.003)		
Controls	X	X	X	X	X	X
Observations	70239	184184	57379	57379	57379	57379
Adjusted R^2	0.33	0.33	0.33	0.33	0.37	0.33
Observations before	40864		28058	28058	28058	28058
Observations after	29375		29321	29321	29321	29321

Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

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