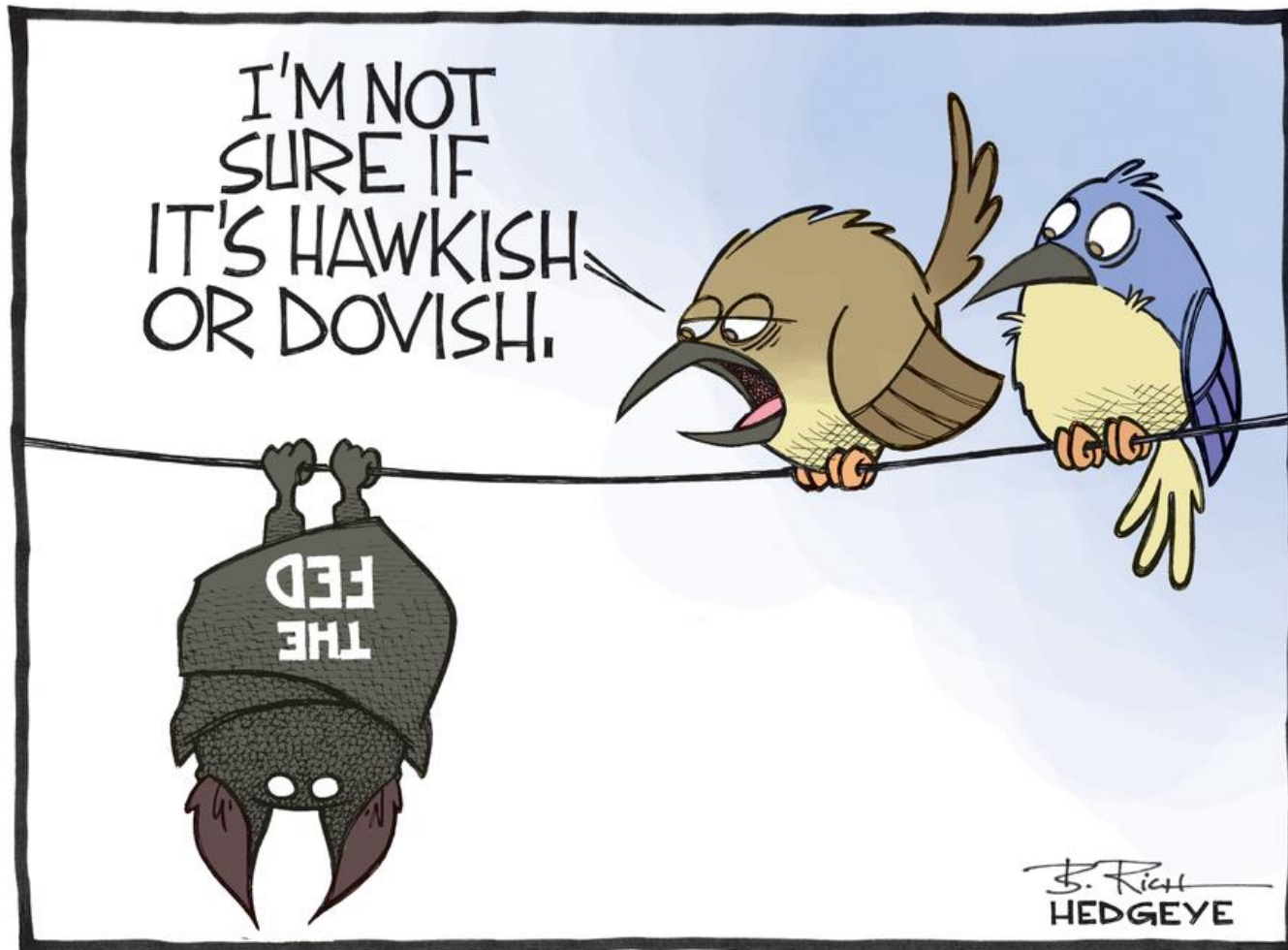# More Than Words
A Textual Analysis of Monetary Policy Communication

Pongsak Luangaram
Warapong Wongwachara

ABFER & CEBRA Session
May 2017

Central bank (CB) communication is a big deal

Literature

- Effective communication widely recognized as key for a successful conduct of monetary policy (Ehrmann and Fratzscher, 2005; Blinder et al., 2008)
- Linguistic analysis gaining more popularity (Hughes and Kesting, 2014; Praet, 2014)
- Computational linguistic tools
  - Macroeconomic effects of communication (Hansen & McMahon, 2016)
  - Impact on financial market volatility of clarity (Jansen, 2011; Jansen and de Hann, 2010)
- Communication strategy (Levin, 2014)

Our contributions

- **Multiple aspects**
  - i. **Readability** – the ease with which a reader can understand a written text
  - ii. **Topics** – the key themes
  - iii. **Tones** – how positive / negative the outlook is in the central bank's language assessment
- **Coverage**: Policy statements of Major and Inflation-targeting (IT) CBs (N = 22) during 2000-2015 (T)
- **Exploratory & transmission analyses**

Analytical framework (1)

Readability

→ *Flesch-Kincaid (FK) Grade Level*
→ *Educational Testing Service (ETS) TextEvaluator*

'Overall consumer prices, as measured by the price index for personal consumption expenditures, increased just 1 percent over the 12 months ending in April, up noticeably from its pace through much of last year but still well short of the Committee's 2 percent objective. Much of this shortfall continues to reflect earlier declines in energy prices and lower prices for imports.'

*Chair Janet L. Yellen *Semiannual Monetary Policy Report to the Congress,* June 2016

Analytical framework (2)

Topics

→ *Latent Dirichlet Allocation (LDA)*
→ *Hierarchical clustering analysis*

'Overall **consumer prices**, as measured by the **price index** for **personal consumption expenditures**, increased just 1 percent over the 12 months ending in April, up noticeably from its **pace** through much of last year but still well short of the **Committee**'s 2 percent **objective**. Much of this shortfall continues to reflect earlier declines in **energy prices** and lower **prices for imports**.'

*Chair Janet L. Yellen *Semiannual Monetary Policy Report to the Congress,* June 2016
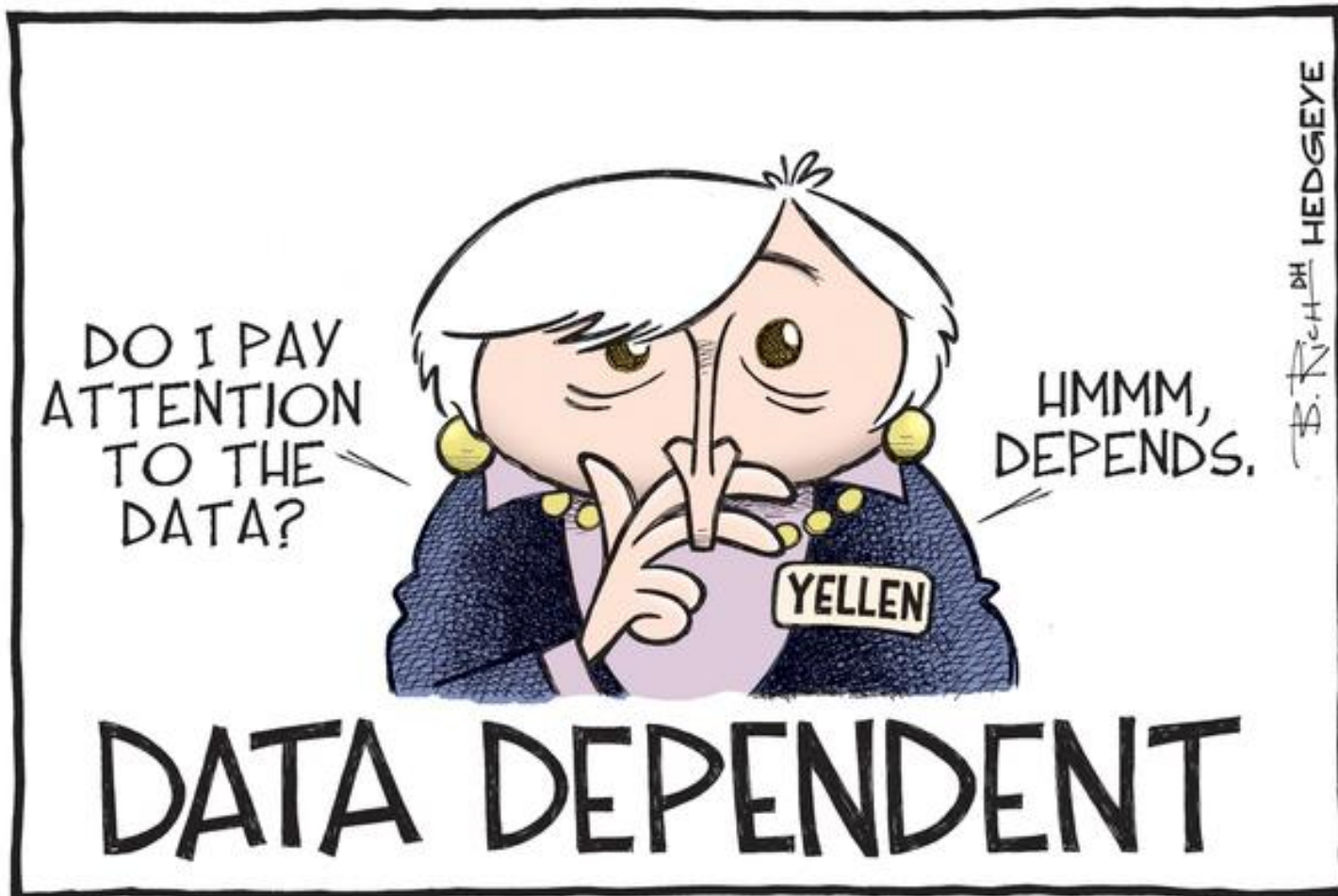
Analytical framework (3)

Tones → *Dictionary-based methods "Hawkish vs Dovish"*

'Overall consumer prices, as measured by the price index for personal consumption expenditures, increased just 1 percent over the 12 months ending in April, up noticeably from its pace through much of last year but still well short of the Committee's 2 percent objective. Much of this shortfall continues to reflect earlier declines in energy prices and lower prices for imports.'

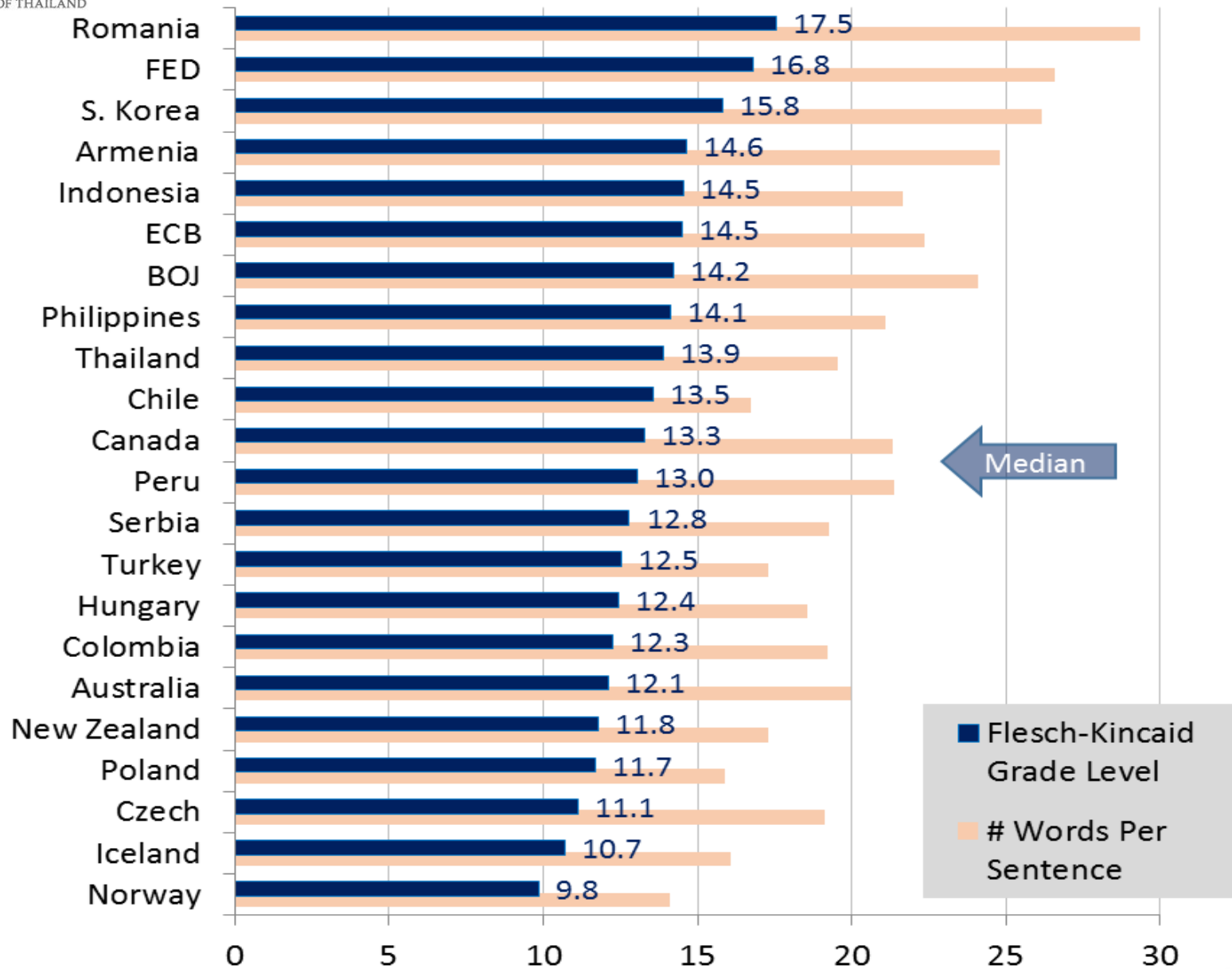*Chair Janet L. Yellen *Semiannual Monetary Policy Report to the Congress,* June 2016

Main results

I. Complicated nature of communication
- Advanced reader required

II. Complex decision making process
- A fairly large number of issues revealed by hierarchical clustering analysis

III. Significant variation across *N* and *T*
- ITs: Inflation matters more than growth
- Global topics more prominent since GFC
- Tone potentially indicative of future rate decision

IV. Effectiveness of monetary policy transmission enhanced by communication*

*preliminary

7 Stylised Facts about CB Communication

Overall complexity of statements

BANK OF THAILAND

Country	Flesch-Kincaid Grade Level
Romania	17.5
FED	16.8
S. Korea	15.8
Armenia	14.6
Indonesia	14.5
ECB	14.5
BOJ	14.2
Philippines	14.1
Thailand	13.9
Chile	13.5
Canada	13.3
Peru	13.0
Serbia	12.8
Turkey	12.5
Hungary	12.4
Colombia	12.3
Australia	12.1
New Zealand	11.8
Poland	11.7
Czech	11.1
Iceland	10.7
Norway	9.8

Median

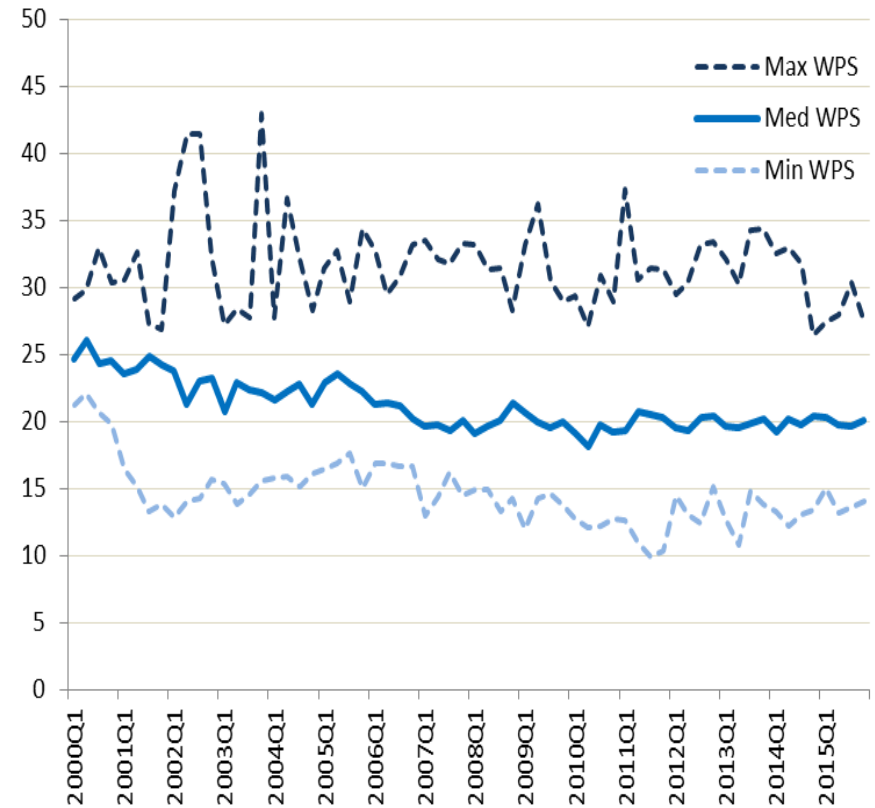■ Flesch-Kincaid Grade Level

■ # Words Per Sentence

Note: The numbers are 2008-2015 averages. FK rates text on a US school grade level.

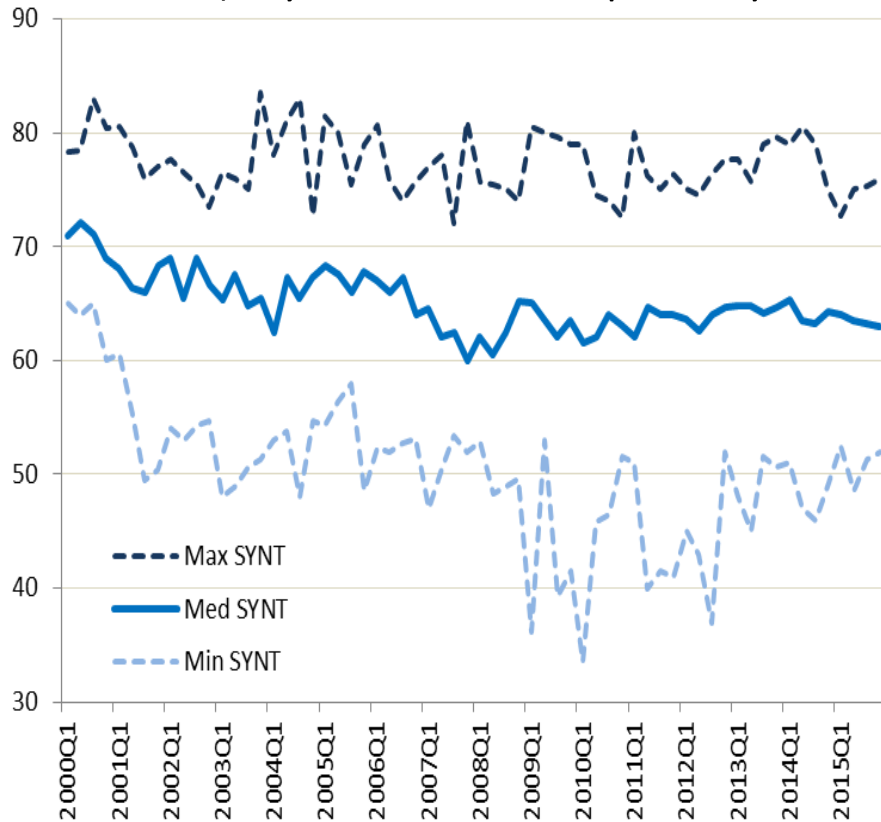# S1: CBs try to communicate more – Syntactic structure
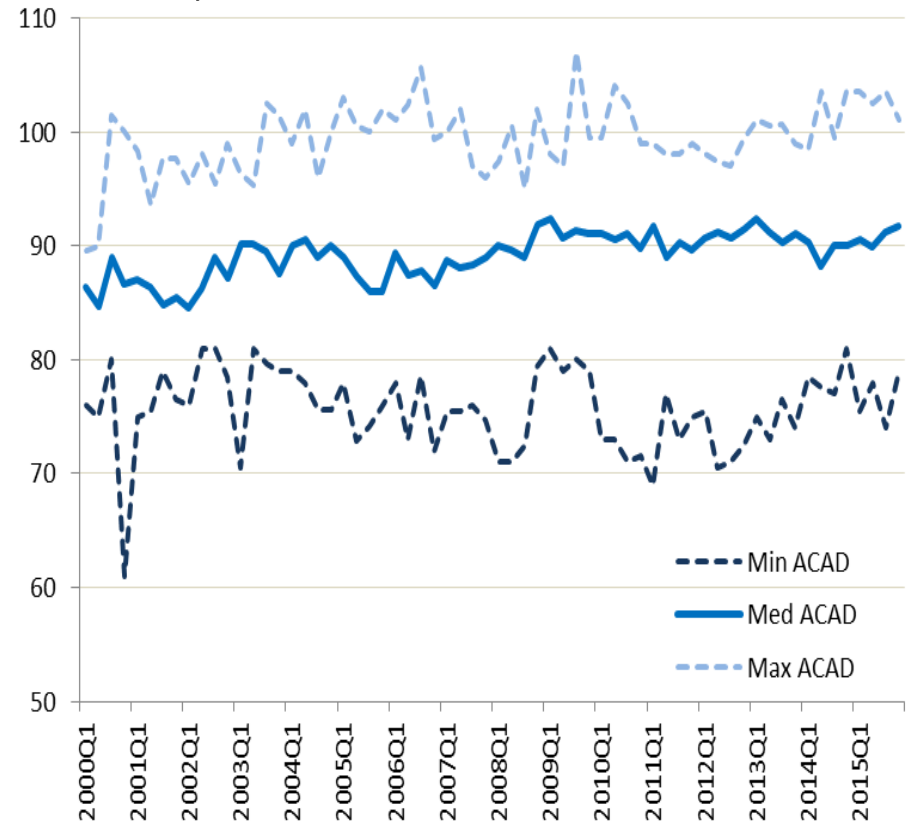
a) Words
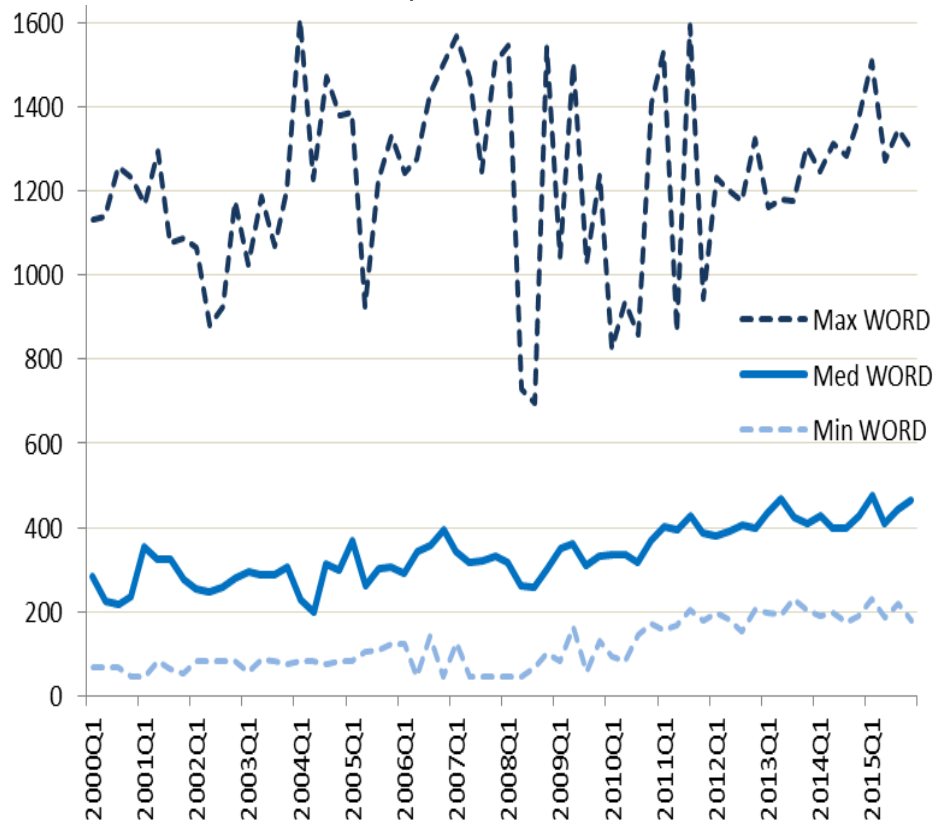
b) Words per sentence

Panel a) shows the median, along with the minimum and maximum, number of total words in a policy statement across 22 central banks over 2000 to 2015. Panel b) shows similar figures for average numbers of words per sentence in a policy statement.

S2: Complexity is due largely to the use of 'big words'

a) Syntactic complexity

b) Academic words score

Legend (panel a):
- Max SYNT
- Med SYNT
- Min SYNT

Legend (panel b):
- Min ACAD
- Med ACAD
- Max ACAD

Panel a) shows the median, along with the minimum and maximum, of ETS Syntactic complexity scores across 22 central banks over 2000 to 2015. Panel b) shows similar figures for Academic words scores.
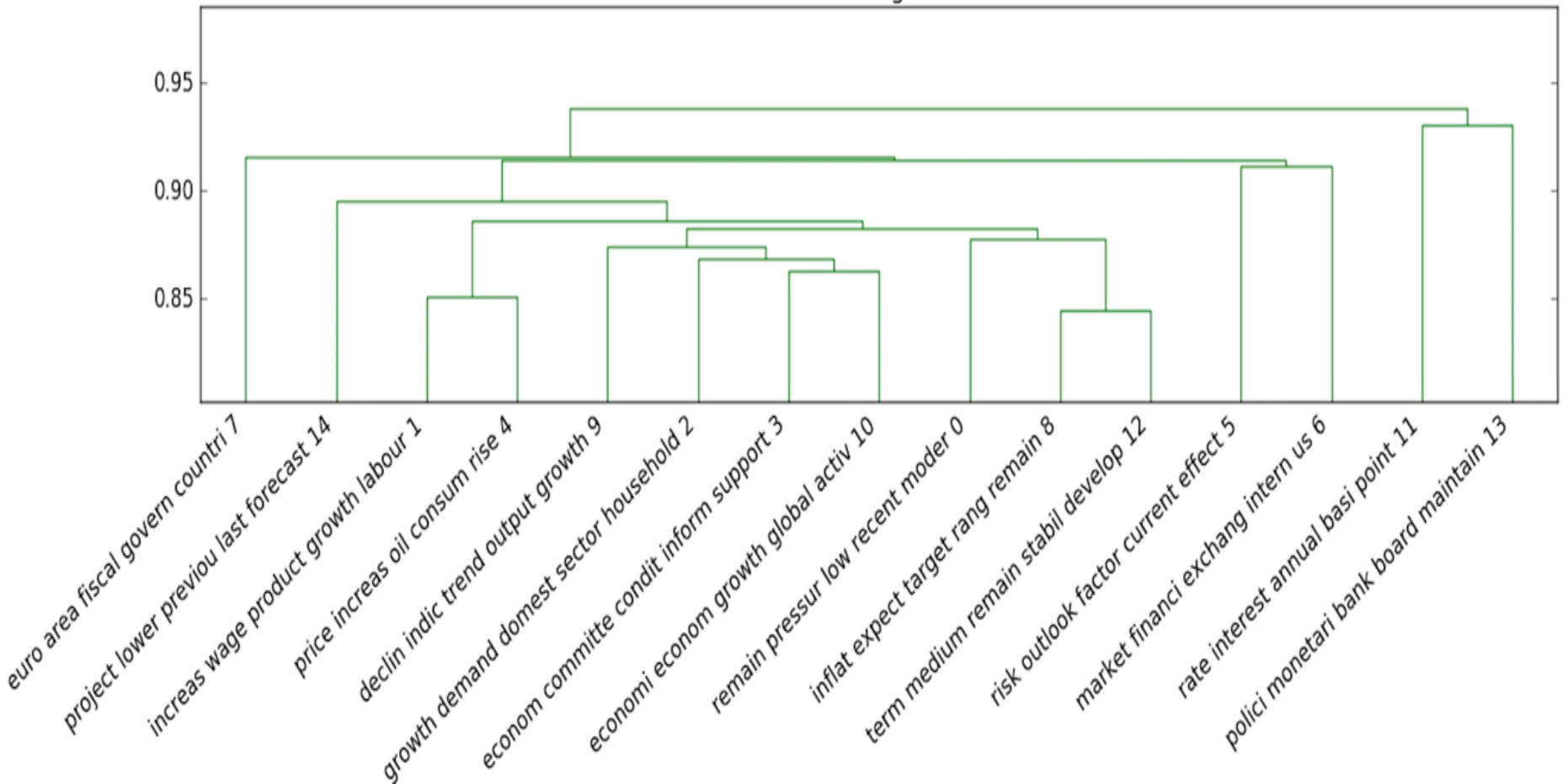
S3: Complexity coincides with rate cuts – FE estimates

Dep.	FK			ETS				
Eq.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
C	6.07	6.04	6.29	1051.07	1018.51	1066.77	38.04	41.42
WPS	0.35	0.35	0.35	11.98	11.37	12.08		
WORD		0.00*			0.10			
SYNT							7.74	7.74
ACAD							5.21	5.20
UNFA							5.63	5.62
CONC							-5.86	-5.87
COHE							-1.31	-1.31
CONV							-1.81	-1.82
ARGU							1.74	1.73
NARR							-0.13	-0.14
RATE			-0.08			-4.65		-0.14
Adj.R-sq	0.91	0.91	0.91	0.65	0.68	0.66	1.00	1.00
# obs.	1,111	1,111	1,055	1,111	1,111	1,055	1,111	1,055

This table shows estimated fixed-effects regressions of readability measures on linguistic units (words and words per sentence), complexity characteristics (ETS Component Scores, namely Syntactic, Academic vocabulary, Unfamiliar words, Concreteness, Cohesion, Conversational style, Argumentation, and Narrativity) and the policy interest rate. This set of (unbalanced) panel data include 22 central banks, and span over 64 quarters from Q1 2000 to Q4 2015. All coefficients are significant 1% or lower level of significance, except those indicated by * which are not significant at 10%.

Top vocabulary in policy statements

Word cloud containing top 200 words used by 12 central banks over 15 years
-- the 'interpretable' topics arise mainly from computing the hidden structure

Topic classification by LDA algorithm

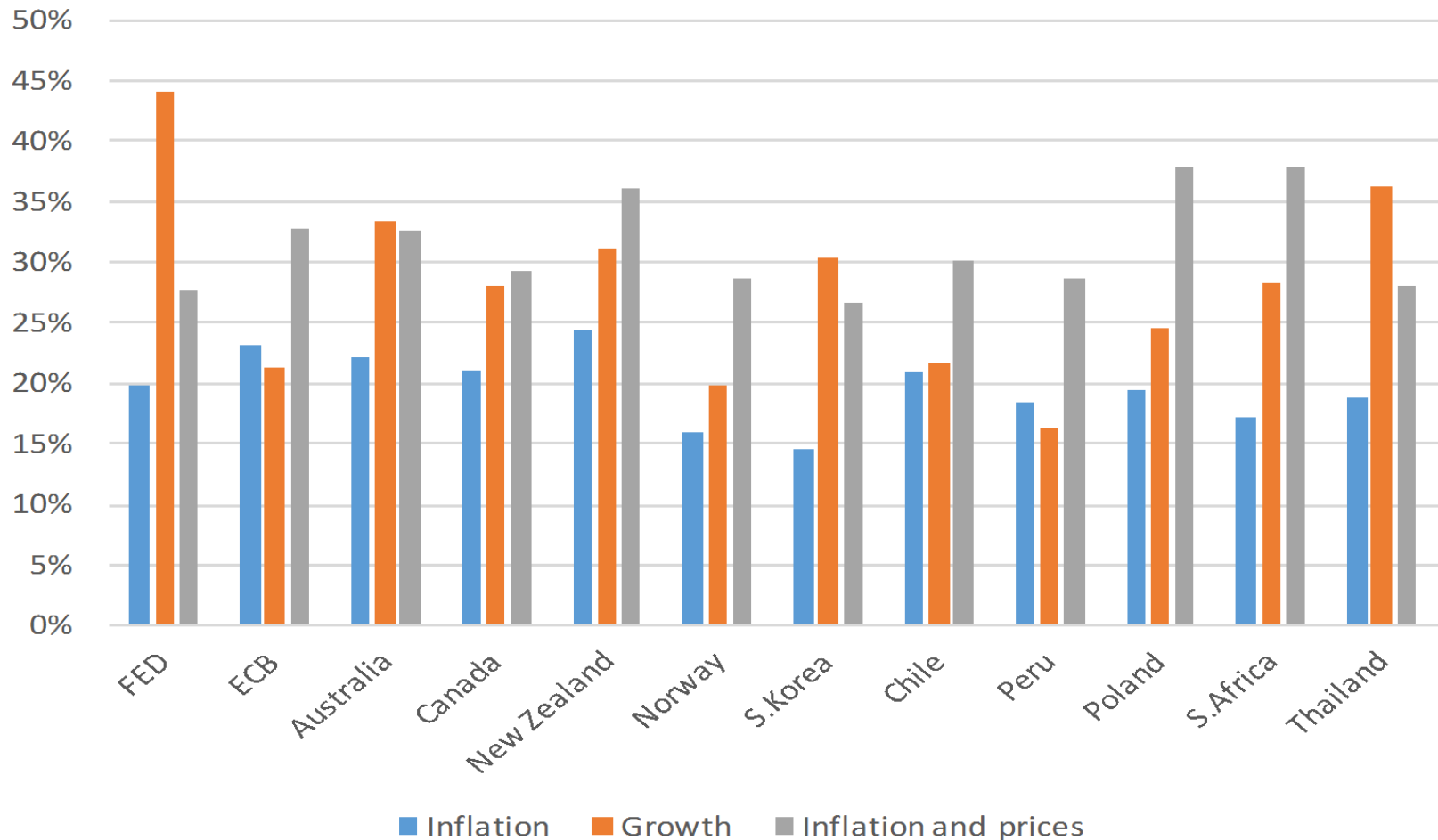# Tree-based hierarchical taxonomy of policy statements

Dendrogram

The vertical axis represents Euclidean distance where the lower the height, the more similar are their word-use patterns.
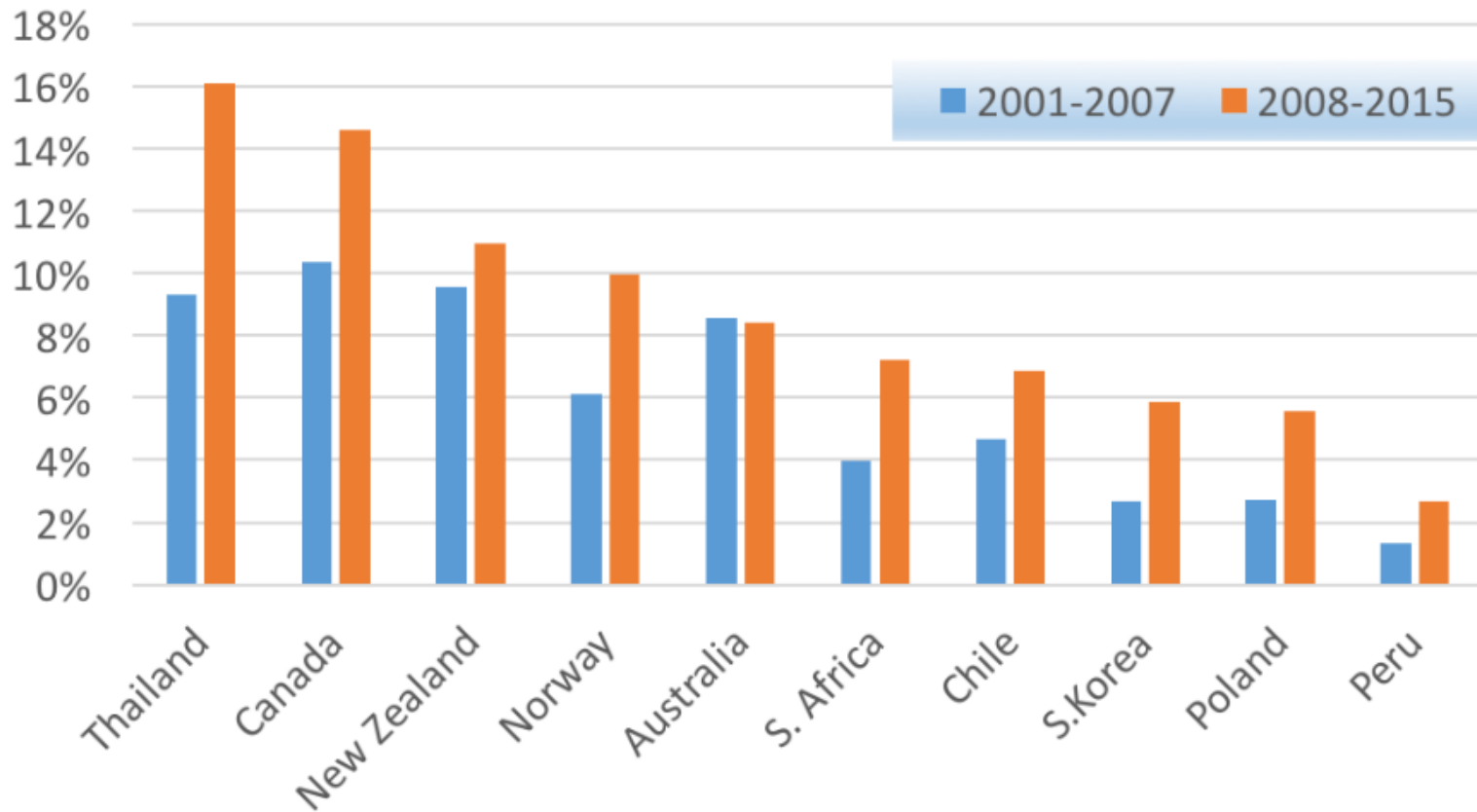
S4: Most ITs discuss more about inflation-related topics

Estimated topic proportions: Inflation vs Growth (2001-2015)
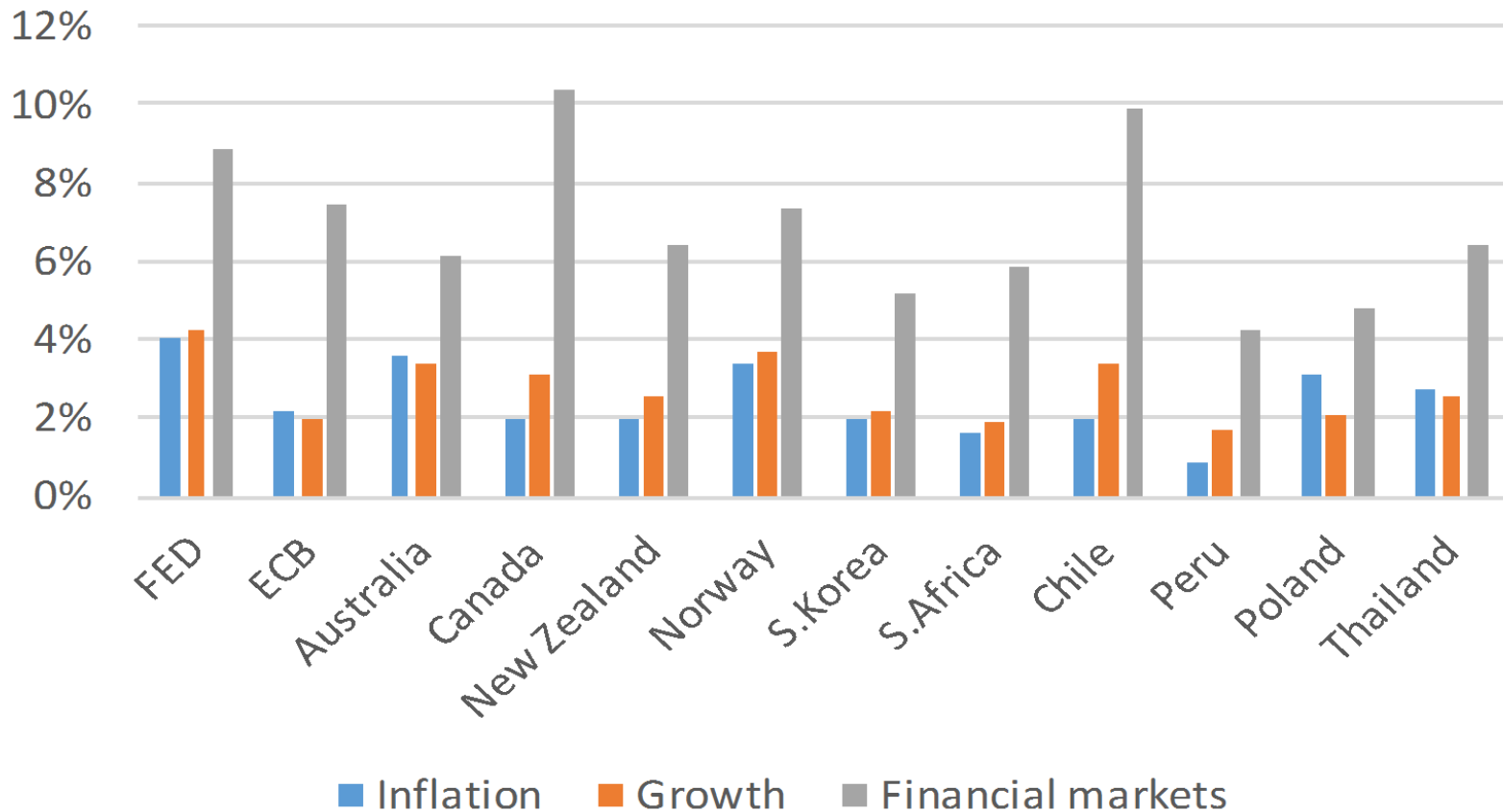
S5: Global topics become more important after GFC
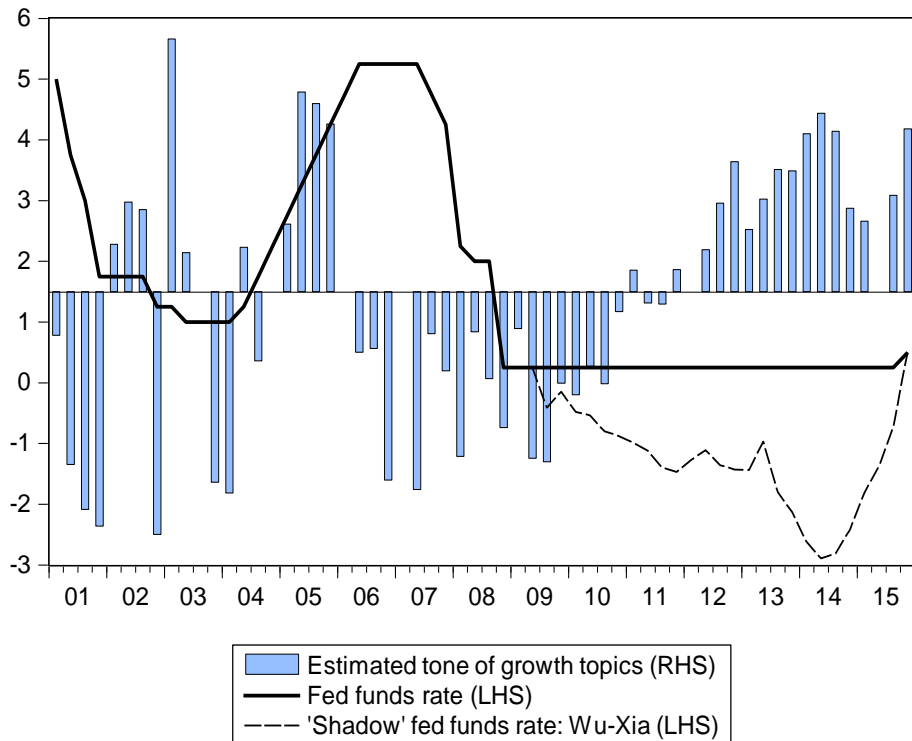

"Global economy" topic

S6: Uncertainty is prevalent among financial market topics

Uncertain words in
Inflation, Growth and Financial market topics

Legend: Inflation, Growth, Financial markets

Policy rates vs Growth & Inflation tones – FOMC

a) Growth topics

Estimated tone of growth topics (RHS)
Fed funds rate (LHS)
'Shadow' fed funds rate: Wu-Xia (LHS)

b) Inflation topics

Estimated tone of inflation topics (RHS)
Fed funds rate (LHS)
'Shadow' fed funds rate: Wu-Xia (LHS)
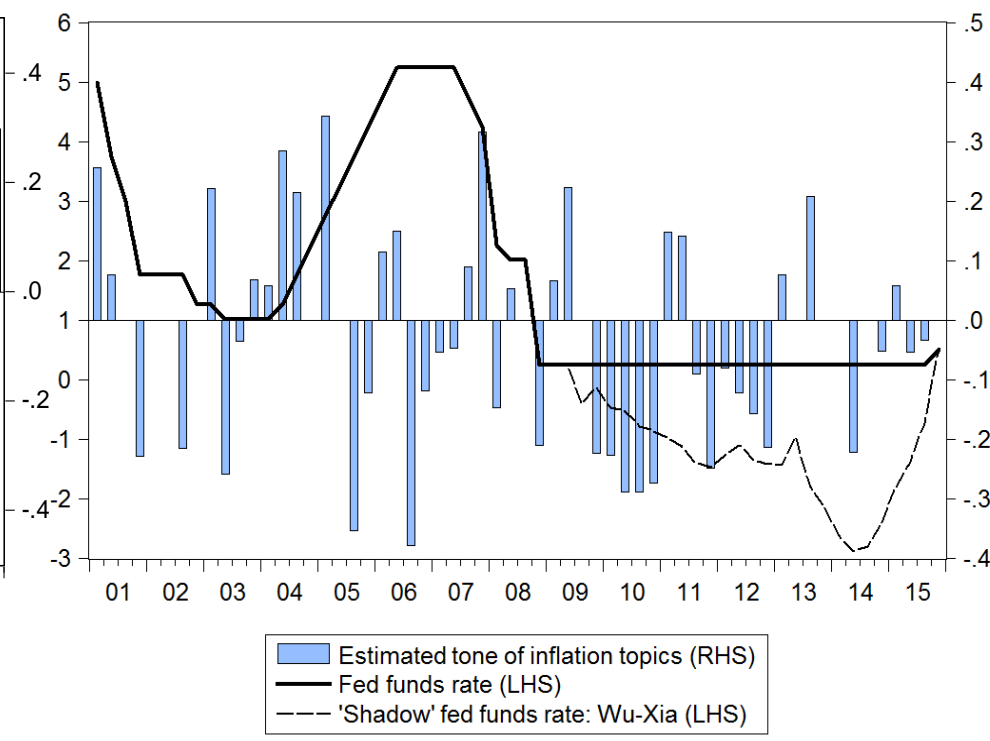
Fed funds rate seems to be significantly related to net tone in economic growth topics, but not to net tone of inflation topics.

BANK OF THAILAND

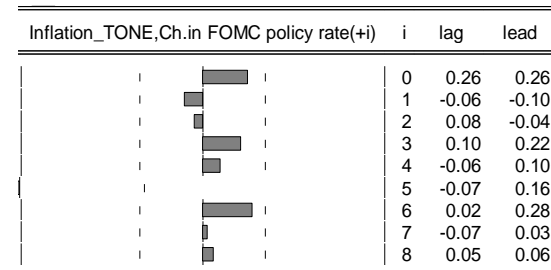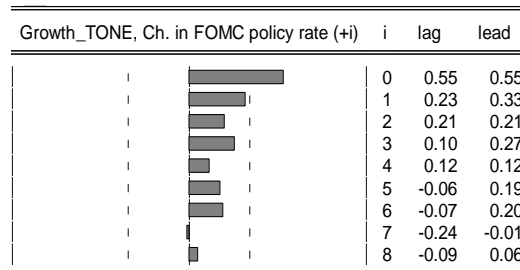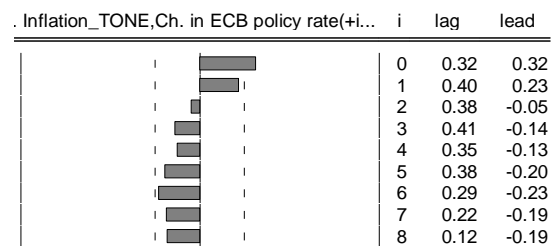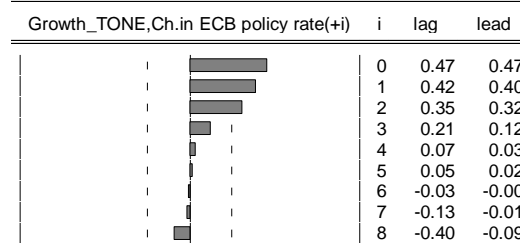# S7: There is a diversity in the degree of informativeness

Growth tone

Inflation tone

FED

Growth_TONE, Ch. in FOMC policy rate (+i)	i	lag	lead
	0	0.55	0.55
	1	0.23	0.33
	2	0.21	0.21
	3	0.10	0.27
	4	0.12	0.12
	5	-0.06	0.19
	6	-0.07	0.20
	7	-0.24	-0.01
	8	-0.09	0.06

Inflation_TONE,Ch.in FOMC policy rate(+i)	i	lag	lead
	0	0.26	0.26
	1	-0.06	-0.10
	2	0.08	-0.04
	3	0.10	0.22
	4	-0.06	0.10
	5	-0.07	0.16
	6	0.02	0.28
	7	-0.07	0.03
	8	0.05	0.06

ECB

Growth_TONE,Ch.in ECB policy rate(+i)	i	lag	lead
	0	0.47	0.47
	1	0.42	0.40
	2	0.35	0.32
	3	0.21	0.12
	4	0.07	0.03
	5	0.05	0.02
	6	-0.03	-0.00
	7	-0.13	-0.01
	8	-0.40	-0.09

Inflation_TONE,Ch. in ECB policy rate(+i...	i	lag	lead
	0	0.32	0.32
	1	0.40	0.23
	2	0.38	-0.05
	3	0.41	-0.14
	4	0.35	-0.13
	5	0.38	-0.20
	6	0.29	-0.23
	7	0.22	-0.19
	8	0.12	-0.19

BOT

Growth_TONE,Ch. in THAI policy rate(+i)	i	lag	lead
	0	0.24	0.24
	1	0.20	0.22
	2	0.03	0.12
	3	-0.21	0.07
	4	-0.16	0.07
	5	-0.24	0.16
	6	-0.09	0.19
	7	0.07	0.28
	8	0.11	0.05

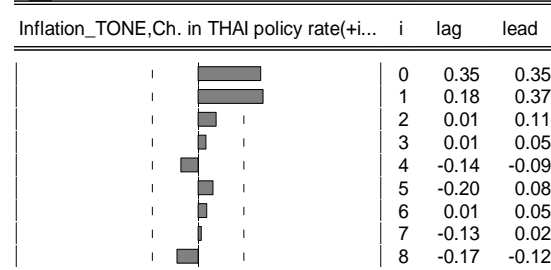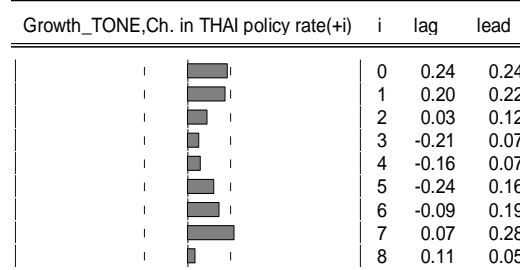| Inflation_TONE,Ch. in THAI policy rate(+i...	i	lag	lead
	0	0.35	0.35
	1	0.18	0.37
	2	0.01	0.11
	3	0.01	0.05
	4	-0.14	-0.09
	5	-0.20	0.08
	6	0.01	0.05
	7	-0.13	0.02
	8	-0.17	-0.12

The figure shows cross-correlations between changes in policy interest rates and net tones of growth topics ('Growth tone') and inflation topics ('Inflation tone') among selected CBs.

Transmission analysis*

- Simple VAR of quarterly GDP growth, inflation, policy rate, and nominal effective exchange rate

- Generalised impulse response (Pesaran and Shin, 1998)

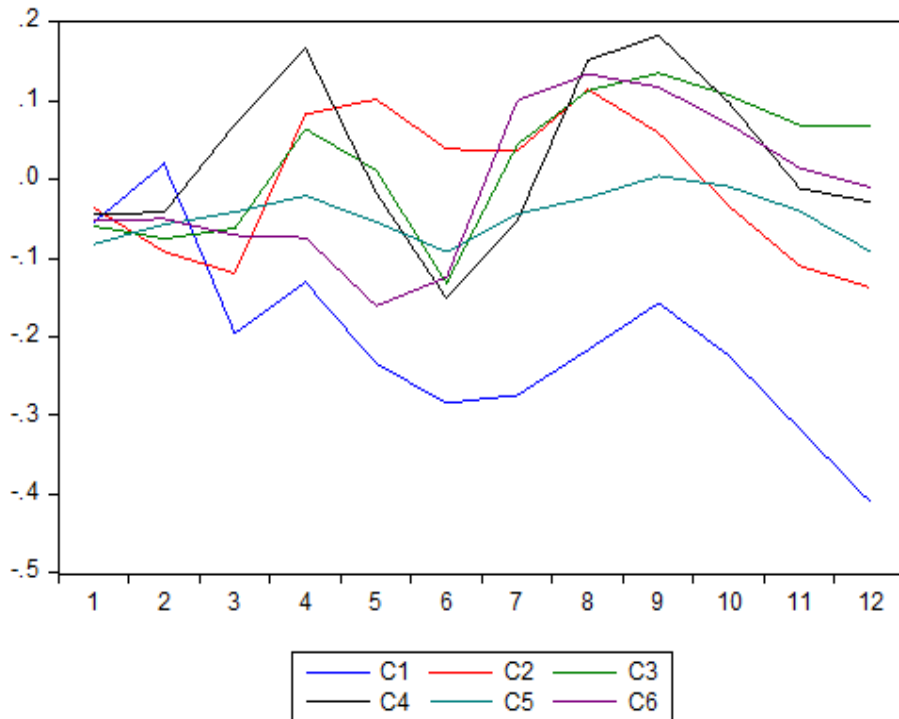- "Switch on-off exercise" (Disyatat and Vongsinsirikul, 2003)

  Impact of comm. =
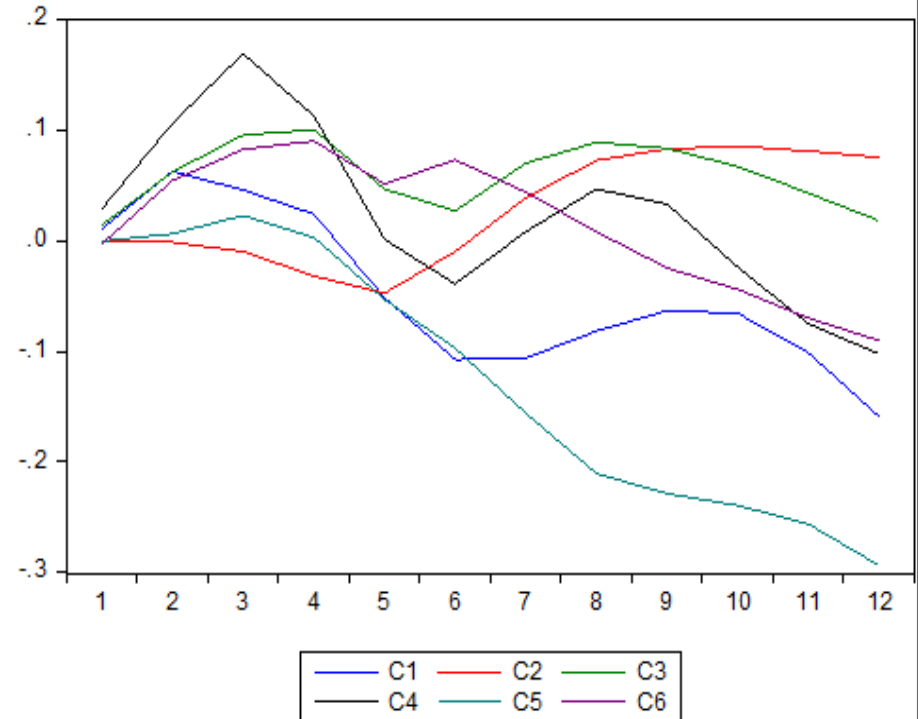 *IRF with endogenous comm. – IRF with exogenous comm.*

- Findings:
  - Contribution to transmission of monetary policy shocks to GDP rather weak
  - Stronger contribution to inflation responses

*preliminary

IRF differences due to communication measures – BOT

a) GDP growth

b) Inflation

This figure shows the impact on macroeconomic variables of one s.d. interest rate shock. The descriptions for measures of communications are as follows. C1 = F-K measure; C2 = ETS score; C3 = Topic – Growth; C4 = Topic – Inflation; C5 = Tone – Growth; C6 = Tone – inflation. IRFs are accumulated.

Concluding remarks

- On communication policy design
  i.   Clear – readability of overall message
  ii. Informative – topics & tones of CB's assessment
- Even more challenging to strike a proper balance between the two (Issing, 2014)
- On computational linguistic tools
  i.   Fruitful use of textual information
  ii. Other applications, e.g. measuring uncertainty (Baker et al., 2015)

Thank you