

# Partition by Exhaustification and Polar Questions

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## 1 Introduction

## 2 Polar questions in Vietnamese

## 3 Polar questions in English

## 4 A challenge

# Questions

- A question specifies a set of propositions, i.e. those that count as its congruent answers

(1) a. Who danced?  
= {Alice danced, Bob danced, Charlie danced, ...}

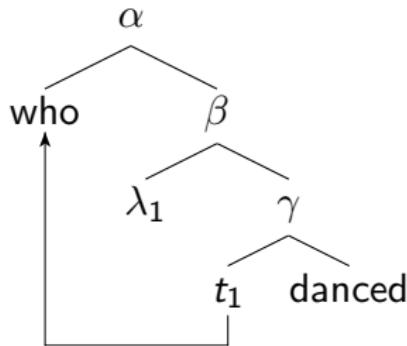
b. Did Mary dance?  
= {Mary danced,  $\neg$ Mary danced}

Hamblin (1958)

# Constituent questions (quasi-formal)

- wh-phrase moves, leaves a trace of type  $e$ , creates a  $\lambda$ -abstract

(2)



- $\llbracket \text{who} \rrbracket = \lambda P_{\langle e, st \rangle}. \lambda p_{st}. \exists x_e. \text{person}(x) \wedge p = P(x)$
- $\llbracket \gamma \rrbracket = x \text{ danced}$
- $\llbracket \beta \rrbracket = \lambda x. x \text{ danced}$
- $\llbracket \alpha \rrbracket = \lambda p. \exists x_e. \text{person}(x) \wedge p = x \text{ danced}$

# Constituent questions: informal

- wh-phrase moves, leaves a trace

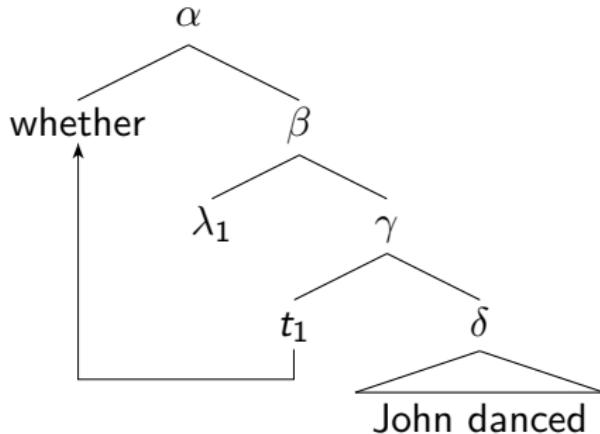
(3) who<sub>1</sub> [t<sub>1</sub> danced]

- a. for which  $x$ ,  $x$  a person:  $x$  danced
- b. {Alice danced, Bob danced, Charlie danced,...}

## Polar questions (quasi-formal)

- wh-phrase moves, leaves a trace of type  $\langle st, st \rangle$ , creates a  $\lambda$ -abstract

(4)



- a.  $\llbracket \text{whether} \rrbracket = \lambda Q_{\langle \langle st, st \rangle, t \rangle} \cdot \lambda p_{st} \cdot \exists f_{\langle st, st \rangle} \cdot pol(f) \wedge p = Q(f)$   
 $\rightarrow pol(f) \text{ iff } f = \text{YES } (\lambda p. p) \text{ or } f = \text{NO } (\lambda p. \neg p)$
- b.  $\llbracket a \rrbracket = \lambda p \cdot \exists f_{\langle st, st \rangle} \cdot pol(f) \wedge p = f(\text{John danced})$

# Polar questions: informal

- wh-phrase moves, leaves a trace

(5) whether<sub>1</sub> [ $t_1$  [John danced]]

- for which  $f$ ,  $f$  a polarity:  $f(\text{John danced})$
- $\{\text{John danced}, \neg\text{John danced}\}$

- matrix **whether** is silent in modern English

Bennett (1977); Higginbotham (1993); Krifka (2001); Guerzoni (2004)

# Ambiguities

- Wh-phrases may move from different positions

(6) Who do you want to succeed?

- who<sub>1</sub> do you want to succeed  $t_1$
- who<sub>1</sub> do you want  $t_1$  to succeed

→ wanna-contraction possible with **succeed** = 'be successor of' but not with **succeed** = 'be successful' (Lakoff, 1970)

(7) Did John even solve problem 2?

- whether<sub>1</sub> [ $t_1$  [even [John solved problem 2]]]
- whether<sub>1</sub> [even [ $t_1$  [John solved problem 2]]]

→ If problem 2 is easy, it's likely John didn't solve it (Guerzoni, 2004)

# Partition by Exhaustification (PbE)

- Fox (2018, 2020) proposes the following felicity condition on questions

(8) Partition by Exhaustification (informal)  
A question is only felicitous if its elements, once exhaustified, partition the context set

# Exhaustification (simplified)

- Exhaustifying an answer means saying that it is the strongest true answer (Groenendijk and Stokhof, 1984; Krifka, 1995; Bar-Lev and Fox, 2020)

$$(9) \quad \text{exh}_Q(p) \Leftrightarrow p \wedge \forall q \in Q : q \rightarrow p \subseteq q$$

- Answers are by default interpreted as exhaustified (Grice, 1967)

(10) A: Who danced?  
 B: Alice and Bob.

(11)  $Q = \{a, b, c, a \wedge b, a \wedge c, b \wedge c, a \wedge b \wedge c\}$

- $\text{exh}_Q(a) = a \wedge \neg b \wedge \neg c$
- $\text{exh}_Q(a \wedge b) = a \wedge b \wedge \neg c$

...

# Partition (informal)

- Partitioning a set means dividing it into “cells”, i.e. non-overlapping non-empty subsets

(12) A set of propositions  $A$  partitions a set of worlds  $C$  iff

- members of  $A$  are mutually exclusive
- members of  $A$  covers the whole of  $C$  (i.e.  $\bigcup A = C$ )

# Illustration of PbE (1)

- Contexts are accommodated so that explicit questions satisfy PbE

(13) Which girl danced?

- $Q = \{a, b, c\}$
- $C = \bigcup\{a \wedge \neg b \wedge \neg c, \neg a \wedge b \wedge \neg c, \neg a \wedge \neg b \wedge c\}$   
~~ exactly one girl danced

(14) Which girls danced?

- $Q = \{a, b, c, a \wedge b, a \wedge c, b \wedge c, a \wedge b \wedge c\}$
- $C = \bigcup\{a \wedge \neg b \wedge \neg c, \neg a \wedge b \wedge \neg c, \neg a \wedge \neg b \wedge c, a \wedge b \wedge \neg c, a \wedge \neg b \wedge c, \neg a \wedge b \wedge c, a \wedge b \wedge c\}$   
~~ at least one girl danced

Dayal (1996); Fox (2018)

# Illustration of PbE

- Contexts are accommodated so that implicit questions satisfy PbE

(15) A: She brought an expensive convertible.

B: No. #She brought a  $\text{red}_F$  convertible.

$$(i) \quad Q = \{\text{expensive}, \text{red}\}$$

$$(ii) \quad C = \bigcup \{\text{expensive} \wedge \neg \text{red}, \neg \text{expensive} \wedge \text{red}\}$$

$$\rightsquigarrow \text{expensive} \Leftrightarrow \neg \text{red}$$

(16) A: She brought an expensive convertible.

B: No. She brought a  $\text{cheap}_F$  convertible.

$$(i) \quad Q = \{\text{expensive}, \text{cheap}\}$$

$$(ii) \quad C = \bigcup \{\text{expensive} \wedge \neg \text{cheap}, \neg \text{expensive} \wedge \text{cheap}\}$$

$$\rightsquigarrow \text{expensive} \Leftrightarrow \neg \text{cheap}$$

Katzir (2023)

# PbE and polar questions

The discussion on PbE has been carried out exclusively with respect to constituent questions. Polar questions have not been considered.

# Agenda

- show how PbE provides a unified explanation to seemingly disparate observations about polar questions in Vietnamese and English
- discuss a challenge

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# Profile

- Polar questions in Vietnamese consists of an affirmative sentence followed by the sentential negation

(17) Nam  $\overset{\circ}{\text{đ}}\overset{\acute{e}}{\text{e}}\overset{\circ}{\text{n}}$

Nam came

(18) a. Nam  $\overset{\circ}{\text{k}}\overset{\circ}{\text{h}}\overset{\circ}{\text{o}}\overset{\circ}{\text{ng}}$   $\overset{\circ}{\text{đ}}\overset{\acute{e}}{\text{e}}\overset{\circ}{\text{n}}$   
Nam NO came  
'Nam didn't come'

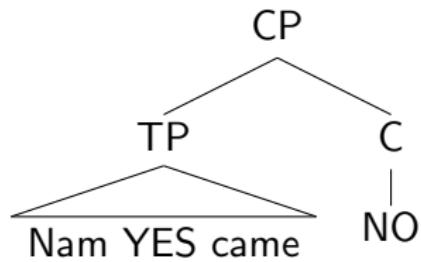
b. Nam  $\overset{\circ}{\text{c}}\overset{\circ}{\text{o}}$   $\overset{\circ}{\text{đ}}\overset{\acute{e}}{\text{e}}\overset{\circ}{\text{n}}$   
Nam YES came  
'Nam did come'

(19) Nam  $\overset{\circ}{\text{c}}\overset{\circ}{\text{o}}$   $\overset{\circ}{\text{đ}}\overset{\acute{e}}{\text{e}}\overset{\circ}{\text{n}}$   $\overset{\circ}{\text{k}}\overset{\circ}{\text{h}}\overset{\circ}{\text{o}}\overset{\circ}{\text{ng}}$   
Nam YES came NO  
'did Nam come?'

# Previous accounts

- final NO is **not** analyzed as negation but as a “question particle” which basically means ‘whether’

(20)



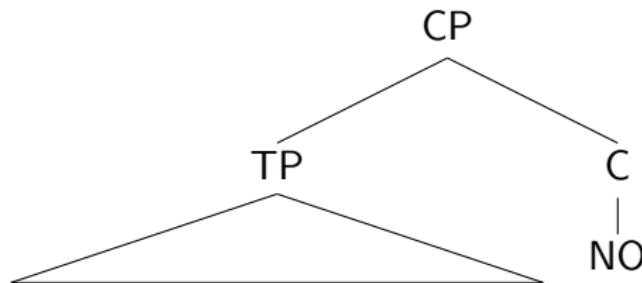
= for which  $f$ ,  $f$  a polarity,  $f(\text{Nam came})$

Trinh (2005); Duffield (2007); Phan (2024)

# Challenge: selection of NO

- an independently acceptable YES-sentence is deviant as complement of interrogative NO

(21)



Nam YES came ✓  
only Nam YES came ✗  
the people YES came ✓  
all/some people YES came ✗  
Nam YES certainly came ✓  
Nam certainly YES came ✗

# Challenge: scope of NO

- constituent questions can 'associate out of' embedded positions but polar questions cannot

(22) a. Nam muốn [Mai gặp ai ]  
Nam want Mai meet who  
'for which  $x$ ,  $x$  a person, Nam wants Mai to meet  $x$ '

b. \*Nam muốn [Mai có đến không]  
Nam want Mai YES come NO  
('for which  $f$ ,  $f$  a polarity, Nam wants  $f$ (Mai to come)')

# Analysis

- Polar questions are basically elliptical alternative questions

(23) a. Nam YES came NO  
b.  $[S_{YES} \text{ Nam YES came}] Q [S_{NO} \text{ Nam NO came}]$

(24) Formal conditions

- a.  $S_{NO}$  is derived from  $S_{YES}$  by replacing YES with NO
- b. everything in  $S_{NO}$  is deleted except NO
- c.  $\llbracket Q \rrbracket = \lambda p. \lambda q. \{p, q\}$

# Form of explanation

- $Q$  is deviant because the context that must be accommodated in order for  $Q$  to satisfy PbE conflicts with other properties of  $Q$

(25) Consequence of PbE

$S_{YES} \wedge \neg S_{NO}$  and  $S_{NO} \wedge \neg S_{YES}$  partition the context set

# ONLY: puzzle

- Subjects in polar questions cannot associate with **only**

(26) chỉ Nam có đến  
only Nam YES came  
'only Nam did come'

(27) #chỉ Nam có đến không?  
only Nam YES came NO  
('did only Nam come?')

# ONLY: explanation

- $S_{YES}$  and  $S_{NO}$  have contradictory presuppositions

(28) only Nam YES came = 'Nam came  $\wedge$  no other did'  
only Nam NO came = 'Nam didn't come  $\wedge$  all others did'

- Even if the presuppositions are locally accommodated, a context partitioned by  $S_{YES} \wedge \neg S_{NO}$  and  $S_{NO} \wedge \neg S_{YES}$  makes **only** semantically superfluous, thus deviant

(29) Common ground: either John won the lottery or Bill and Mary did

- a. Who won?
- b. Did John win?
- c. #Did only John win?

## Quantifiers: puzzle

- Polar questions with quantified subjects are deviant

(30) a. ai cũng có đến  
everyone YES came  
'everyone did come'  
b. một người có đến  
someone YES came  
'someone did come'

(31) a. #ai cũng có đến không?  
everyone YES came NO  
('did everyone come?')  
b. #một người có đến không?  
someone YES came NO  
('did someone come?')

## Quantifiers: explanation

- $S_{YES}$  and  $S_{NO}$  partition  $C$  only if  $C$  is homogeneous

(32) a. everyone YES came =  $\forall x. x \text{ came}$   
everyone NO came =  $\forall x. \neg x \text{ came}$   
b. someone YES came =  $\exists x. x \text{ came}$   
someone NO came =  $\exists x. \neg x \text{ came}$

(33)  $C = \text{all came, none came}$

- Maximize Presupposition would favor definites over quantifiers

(34) mọi người có đến không?  
the people YES came NO

Heim (1991)

# Modal adverbs: puzzle

- Adverbs like **certainly** can occur before and after YES in declaratives, but must occur after YES in polar questions

(35) a. Nam có chắc chắn đến  
Nam YES certainly came

b. Nam chắc chắn có đến  
Nam certainly YES came

(36) a. Nam có chắc chắn đến không?  
Nam YES certainly come NO

b. #Nam chắc chắn có đến không?  
Nam certainly YES come NO

# Modal adverbs: explanation

- The position of **certainly** makes a difference in  $S_{NO}$

(37) a. Nam YES certainly came =  $\square$ Nam came  
                   Nam NO  certainly came =  $\neg\square$ Nam came

      b. Nam certainly YES came =  $\square$ Nam came  
                   Nam certainly NO  came =  $\square\neg$ Nam came

- When  $C = \square p \vee \square \neg p$ , the use of **certainly** is strange

(38) a. Look out the window and tell me if it's raining  
       b. #Look out the window and tell me if it's certainly raining

von Fintel and Gillies (2010)

# Embedding: puzzle

- Constituent questions can, but polar questions cannot, associate out of embedded clauses

(39) a. Nam muốn ai đến?  
 Nam want who come  
 'which  $x$ ,  $x$  a person: Nam wants  $x$  to come'

b. #Nam muốn Lan có đến không?  
 Nam want Lan YES come NO  
 ('which  $f$ ,  $f$  a polarity: Nam wants  $f$ (Lan to come)')

- The matrix verb can be questioned

(40) Nam có muốn Lan đến không?  
 Nam YES want Lan come NO  
 'which  $f$ ,  $f$  a polarity,  $f$ (Nam wants Lan to come)'

# Embedding: explanation

- The cells in the partition settle the question what Nam wants

(41) Nam want Lan YES come = Nam wants (Lan comes)  
Nam want Lan NO come = Nam wants ( $\neg$ Lan comes)

- Hypothesis: grammar prefers constituent questions

(42) Nam muốn gì?  
Nam want what

## Excursus: Chinese

- Chinese A-not-A questions show similar restrictions as Vietnamese polar questions

(43) a. Zhangsan chi  
Zhangsan eat

b. Zhangsan chi-bu-chi  
Zhangsan eat-not-eat

- A analysis similar to that for Vietnamese polar questions is possible

(44) Zhangsan eat Q ~~Zhangsan~~ not eat

McCawley (1994); Ernst (1994); Wu (1997)

# Chinese: ONLY

(45) ONLY

- a. zhiyou zhangsan chi  
only Zhangsan eat
- b. #zhiyou Zhangsan chi-bu-chi  
only Zhangsan eat-not-eat

# Chinese: Quantifiers

## (46) Quantifiers

- a. meigerendou chi  
everyone eat
- b. youren chi  
someone eat
- a'. #meigerendou chi-bu-chi?  
everyone eat-not-eat
- b'. #youren chi-bu-chi?  
someone eat-not-eat

## (47) Modal adverbs

- a. Zhangsan yi-bu-yiding chi?  
Zhangsan cert-not-certain eat
- b. #Zhangsan yiding chi-bu-chi?  
Zhangsan certain eat-not-eat

# Embedding

## (48) Embedding

- a. Lisi xi-bu-xihuan women he piju  
Lisi like-not-like us drink beer
- b. #Lisi xihuan women he-bu-he piju  
Lisi like us drink-not-drink beer

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# Syntactic strategy: wh-movement

- Recall that English expresses polar question with **whether** which moves from scope sites and is silent in matrix

(49) did John even solve problem 2?

- $\text{whether}_1 [t_1 [\text{even} [\text{John solve problem 2}]]]$   
= which  $f$ ,  $f$  a polarity,  $f(\text{even}(\text{John solve problem 2}))$
- $\text{whether}_1 [\text{even} [t_1 [\text{John solve problem 2}]]]$   
= which  $f$ ,  $f$  a polarity,  $\text{even}(f(\text{John solve problem 2}))$

# Vietnamese & English

Because the trace of **whether** is silent, cases of deviant sentences in Vietnamese become cases of missing readings in English

# Quantifiers: English

- the trace of **whether** must scope above quantified subjects

(50) did everyone come?

- $\text{whether}_1 [t_1 [\text{everyone}_2 [t_2 \text{ came}]]] = \{\forall x.Px, \neg\forall x.Px\}$
- $\#\text{whether}_1 [\text{everyone}_2 [t_1 [t_2 \text{ came}]]] = \{\forall x.Px, \forall x.\neg Px\}$

(51) did someone come?

- $\text{whether}_1 [t_1 [\text{someone}_2 [t_2 \text{ came}]]] = \{\exists x.Px, \neg\exists x.Px\}$
- $\#\text{whether}_1 [\text{someone}_2 [t_1 [t_2 \text{ came}]]] = \{\exists x.Px, \exists x.\neg Px\}$

# ONLY: English

- the trace of **whether** must scope above **only**

(52) did only John<sub>F</sub> come?

- whether<sub>1</sub> [t<sub>1</sub> [only [John<sub>F</sub> came]]] = {only *p*,  $\neg$ only *p*}
- #whether<sub>1</sub> [only [t<sub>1</sub> [John<sub>F</sub> came]]]] = {only *p*, only  $\neg$ *p*}

# Modal adverbs: English

- the trace of **whether** must scope above **certainly**

(53) Will John certainly win?

- a.  $\text{whether}_1 [t_1 [\text{certainly} [\text{John will win}]]] = \{\Box p, \neg\Box p\}$
- b.  $\#\text{whether}_1 [\text{certainly} [t_1 [\text{John will win}]]] = \{\Box p, \Box \neg p\}$

(54) A: Will John certainly win?

B: No.

A: What makes you think he might lose? /  $\#\text{What makes you think he will lose?}$

# Embedding: English

- the trace of **whether** cannot be inside an embedded clause

(55) does John want Mary to win

a.  $\text{whether}_1 [t_1 [\text{John wants Mary to win}]]$

$= \{\text{want } p, \neg\text{want } p\}$

b.  $\#\text{whether}_1 [\text{John wants } [t_1 [\text{Mary to win}]]]$

$= \{\text{want } p, \text{want } \neg p\}$

(56) A: Do you want Mary to win?

B: No.

A: Why do you not want her to win? /  $\#\text{Why do you want her not to win?}$

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# Alternative questions

- the questions below all seem fine

(57) a. Did only John come or did only he not come?  
b. Did everyone come or did no one come?  
c. Will John certainly win or will he certainly not win?  
d. Do you want John to win or do you want him not to win?

(58) Please choose an answer!

A Mary brought an expensive convertible  
B Mary brought a red convertible

...

→ the same holds for Vietnamese

# Hypothesis

- These cases involve covert speech act operators

(59) Did everyone come or did no one come?  
 $Q = \{H \text{ ASSERTS everyone came}, H \text{ ASSERTS no one came}\}$

(60) Please choose an answer!

A Mary brought an expensive convertible  
B Mary brought a red convertible

$Q = \{H \text{ ASSERTS Mary brought an expensive convertible}, H \text{ ASSERTS Mary brought a red convertible}\}$

- Research question: what are the conditions under which speech act operators can be inserted?

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