

Inference Anchoring Theory: Foundations (1/2)

Katarzyna Budzynska
argdiap.pl

Chris Reed
arg-tech.org

Inference Anchoring Theory, IAT (Budzynska & Reed 2011)

$$\frac{P \quad P \rightarrow Q}{Q}$$

Bob: P

Wilma: Why?

Bob: Q

Types of communication structures

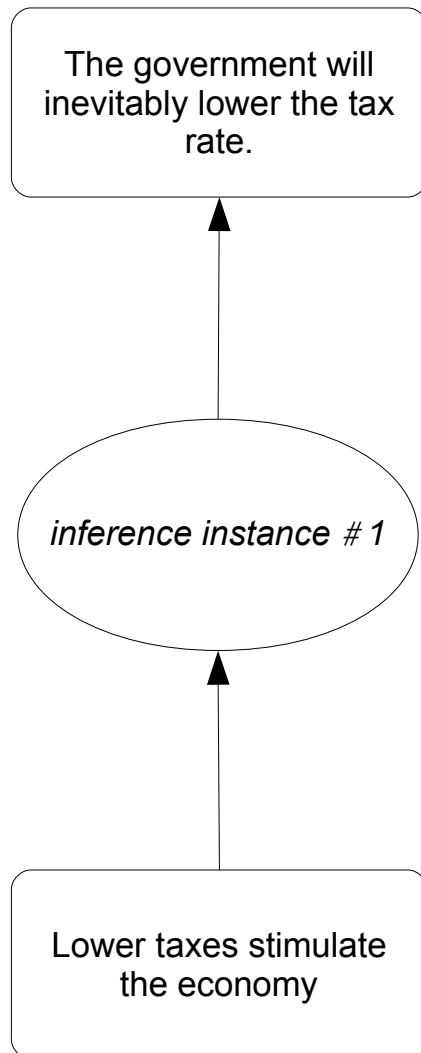
(Ex1)

(1.1) Bob says, The government will inevitably lower the tax rate.

(1.2) Wilma says, Why?

(1.3) Bob says, Lower taxes stimulate the economy.

1st Type: Inference structures



What inferences are typical for natural communication?

Formal logic

- “Classic” inference
 - if $A \vdash B$, then $\{A, C\} \vdash B$
 - propositional logic, first-order logic, modal logic, etc.
- Non-monotonic inference
 - if $A \vdash B$, then it might not be the case that $\{A, C\} \vdash B$
 - nonmonotonic logic, defeasible logic

What inferences are typical for natural communication?

Informal logic & argumentation theory

- argumentation schemes
 - plausible, uncertain reasoning
 - critical questions
 - (Walton et al. 2008)

What inferences are typical for natural communication?

ARGUMENT FROM POSITION TO KNOW

Premise1: *i* is in a position to know *A*

Premise2: *i* asserts that *A*

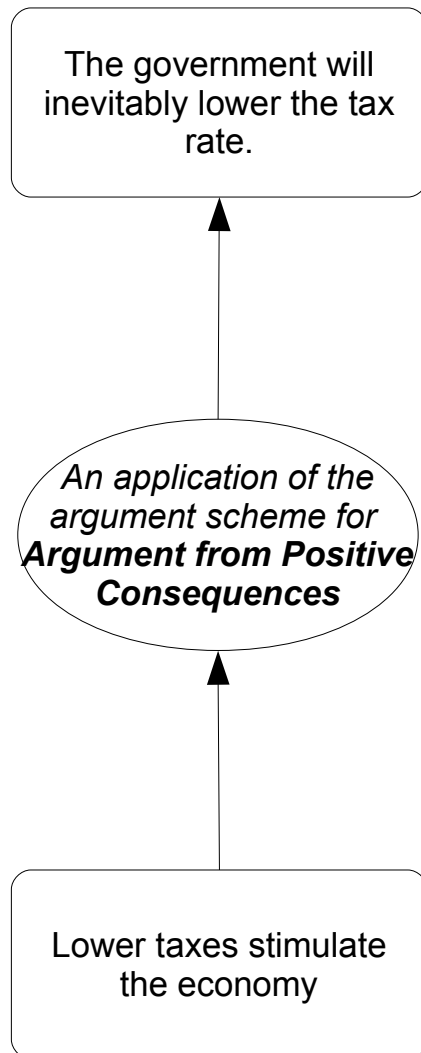
Conclusion: *A* may plausibly be taken to be true

(CQ1) Is *i* in a position to know whether *A* is true?

(CQ2) Is *i* an honest (trustworthy, reliable) source?

(CQ3) Did *i* assert that *A* is true?

1st Type: Inference structures



Types of communication structures

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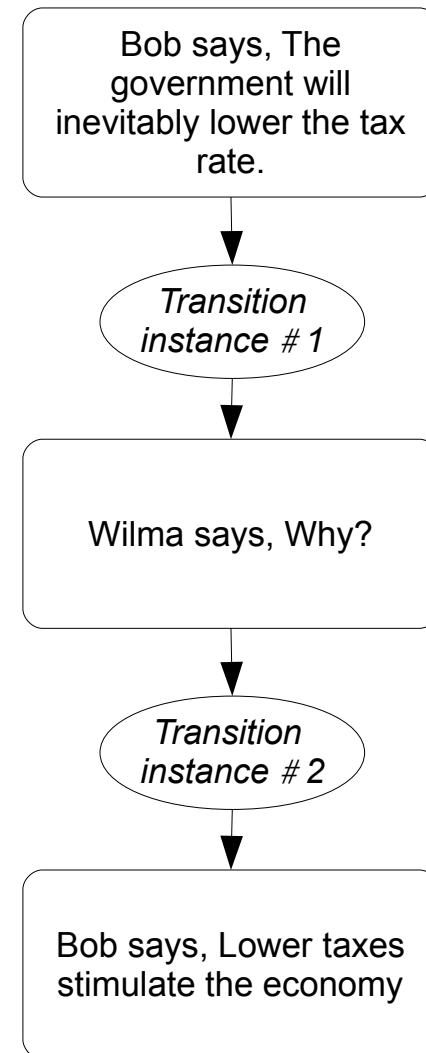
2nd Type: Dialogue structures

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2nd Type: Dialogue structures



What transitions are typical for natural communication?

Formal dialogue systems (dialogue games)

- Protocol – how to play a game
 - if S makes a move A , then R is allowed to execute B
 - Lorenzen's dialogical logic, Hamblin's formal dialectics
 - Now: many, many more

What transitions are typical for natural communication?

Persuasion dialogue system (Prakken 2005)

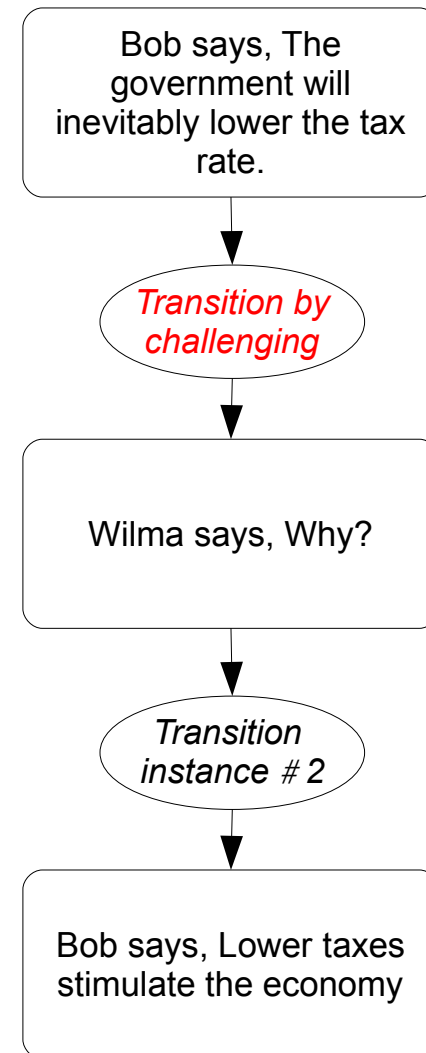
- $\text{claim}(p)$ **then** $\text{why}(p)$, $\text{claim}(\text{not-}p)$, $\text{concede}(p)$
- $\text{why}(p)$ **then** $\text{argue}(A)$, $\text{retract}(p)$
- $\text{argue}(A)$ **then** $\text{why}(p)$, $\text{concede}(p)$; where p is $\text{prem}(A)$
- $\text{concede}(p)$ **then** `NOMOVE`
- $\text{retract}(p)$ **then** `NOMOVE`

What transitions are typical for natural communication?

Persuasion dialogue system (Prakken 2005)

- **claim(p) then why(p)**, claim(not- p), concede(p)
- why(p) **then** argue(A), retract(p)
- argue(A) **then** why(p), concede(p); where p is prem(A)
- concede(p) **then** NOMOVE
- retract(p) **then** NOMOVE

2nd Type: Dialogue structures

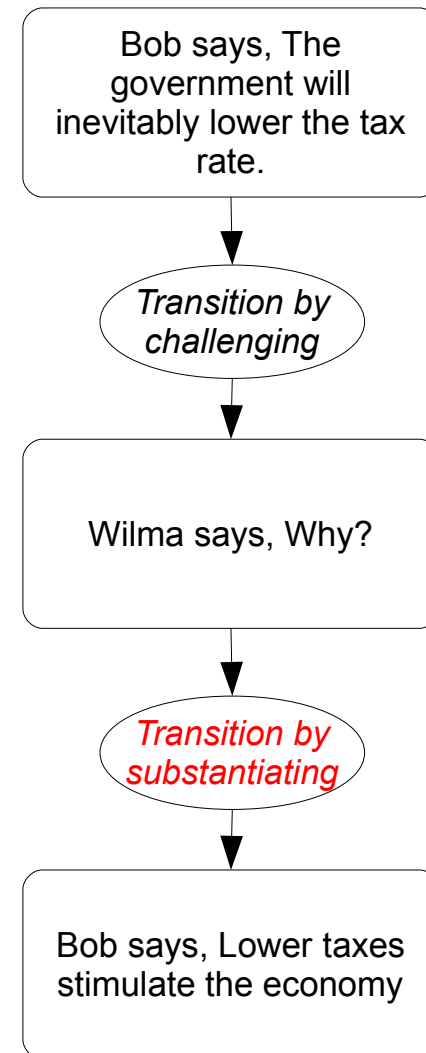


What transitions are typical for natural communication?

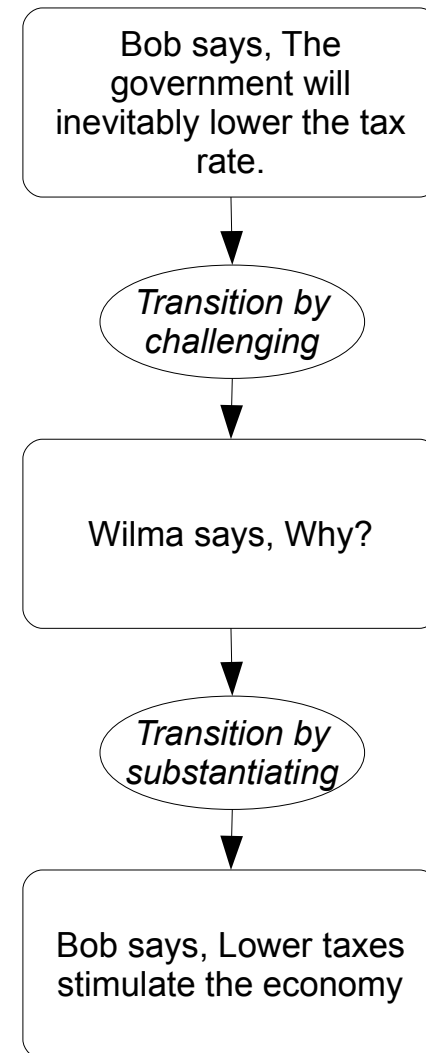
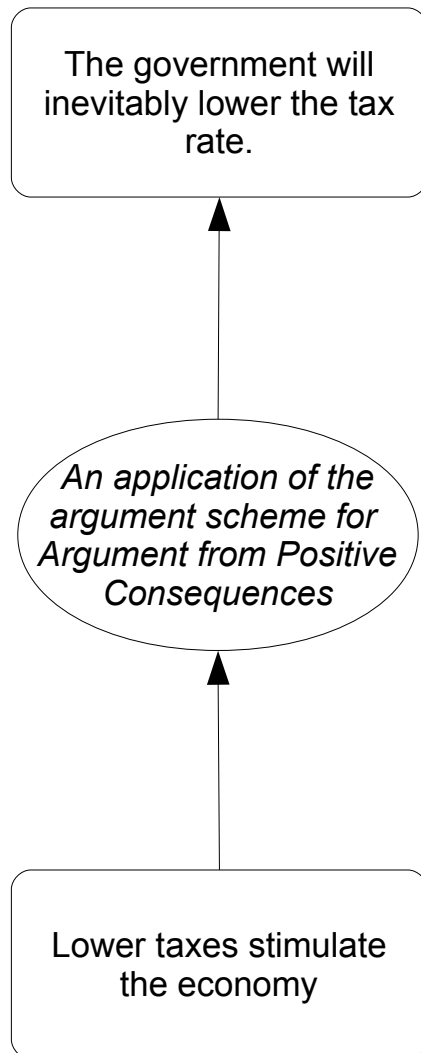
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2nd Type: Dialogue structures



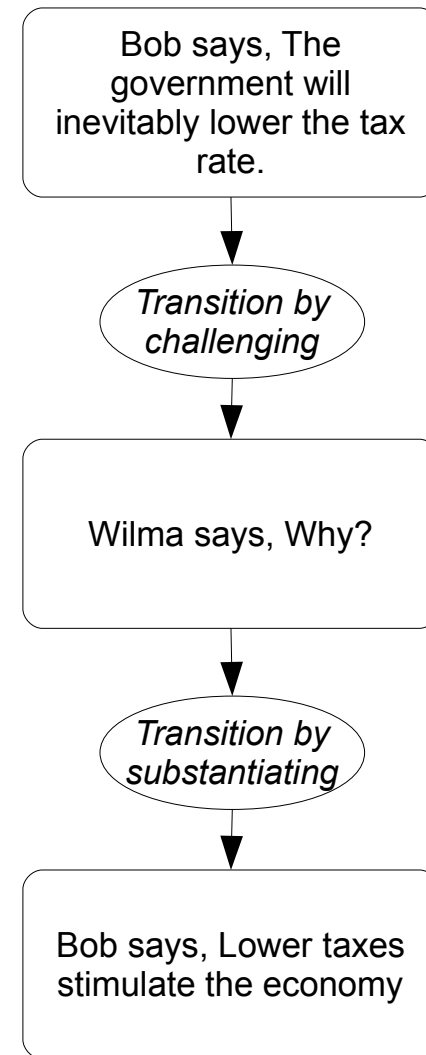
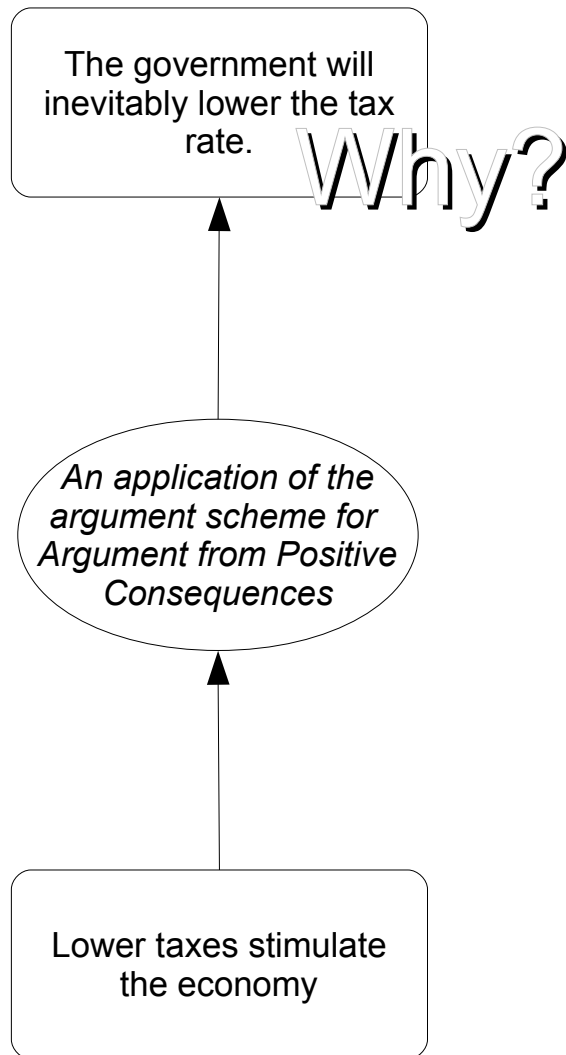
1st Type and 2nd Type



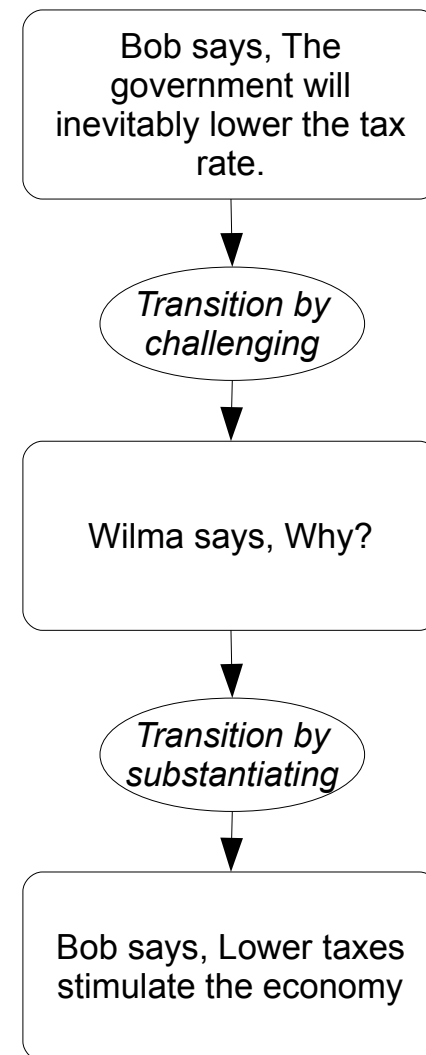
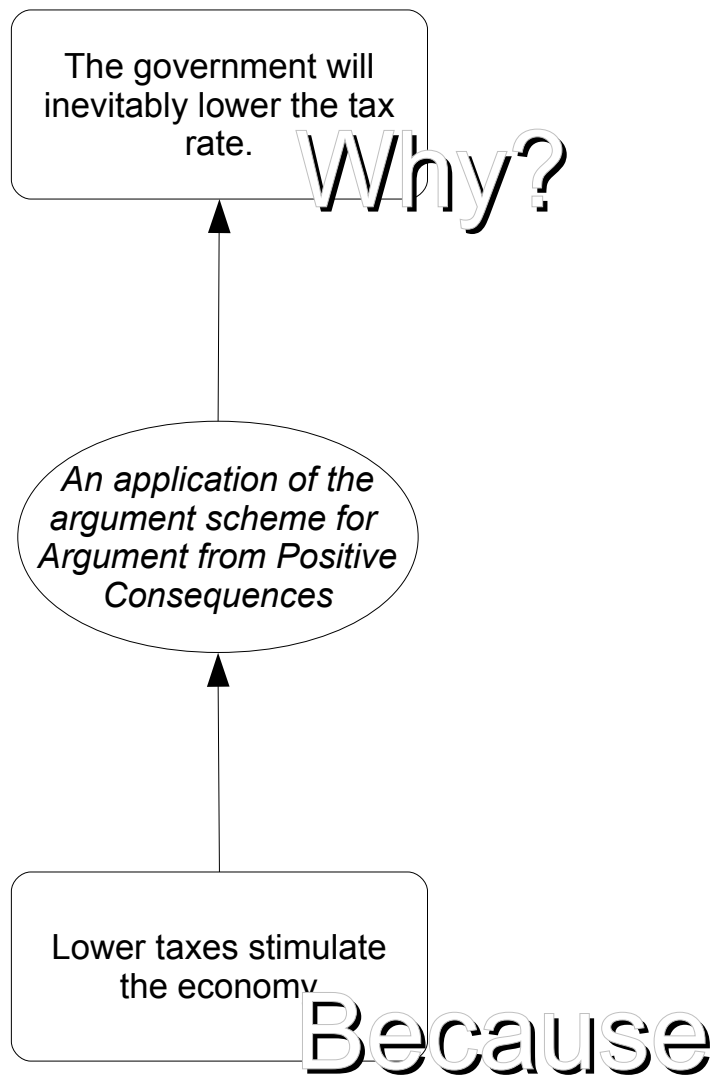
Similarities

- Locutions are themselves propositional: they are **propositional reports of locution events**
- Connections between these reports have a particular character. Given $\alpha \rightarrow \beta$, α is giving us a reason to believe the truth of β .
- This is closely analogous to traditional inference

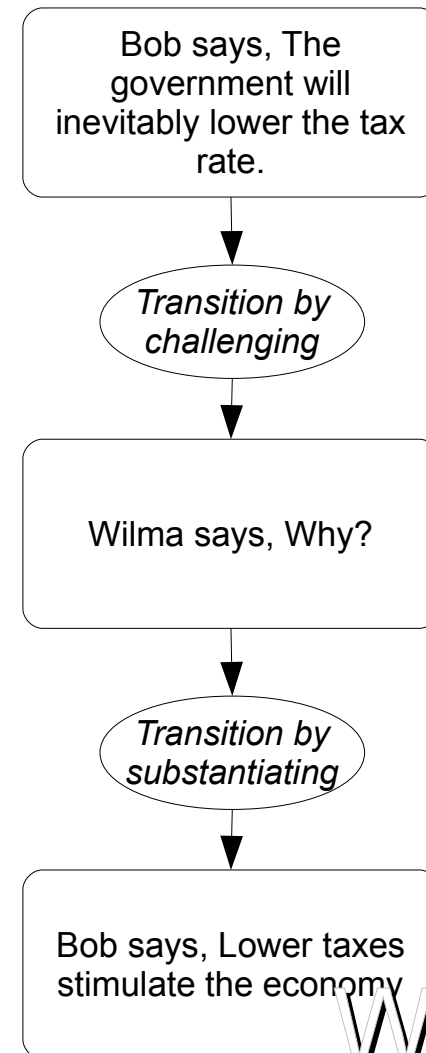
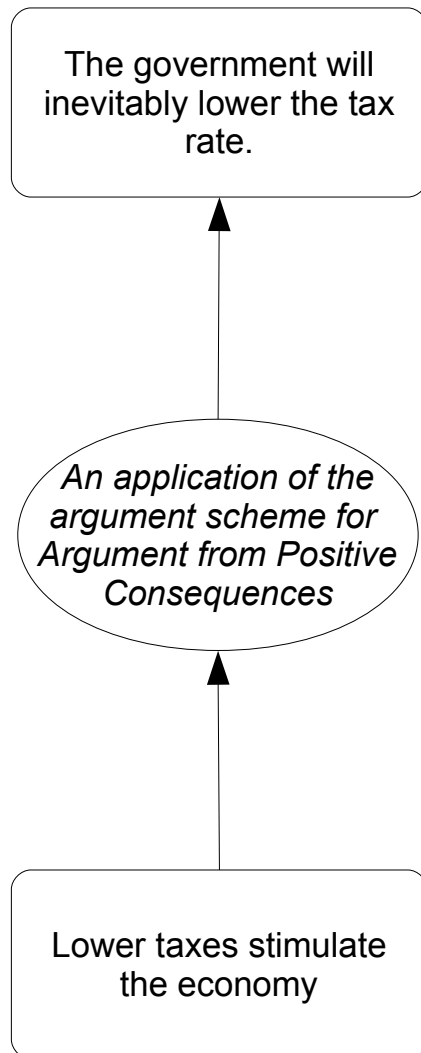
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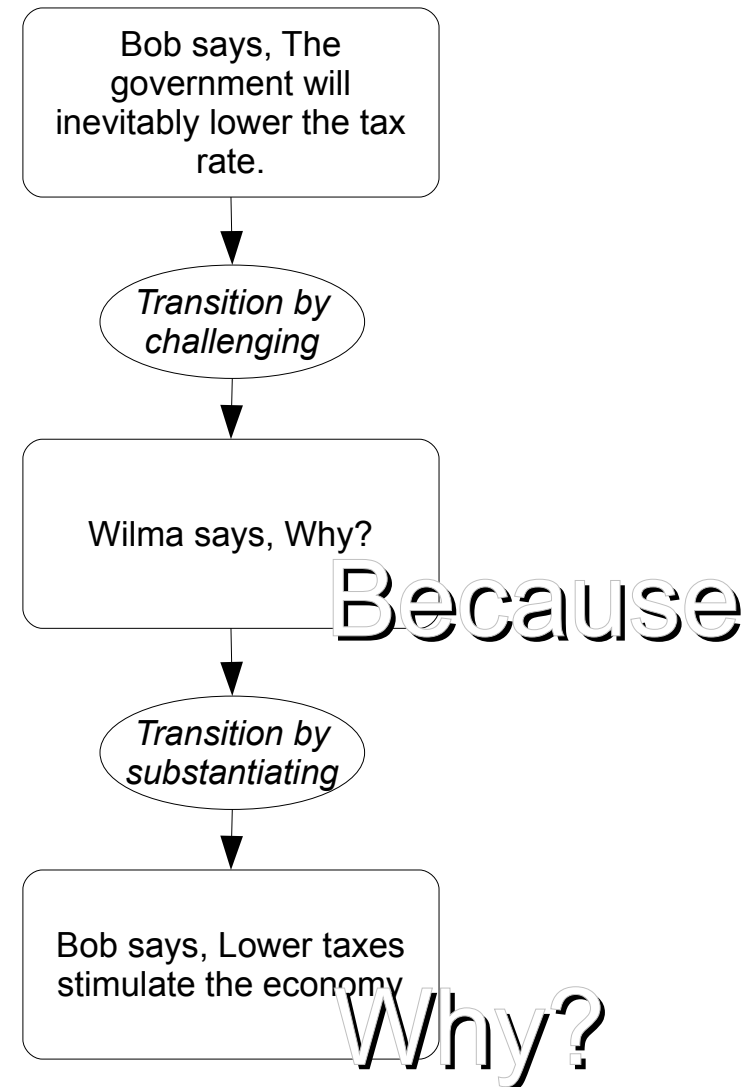
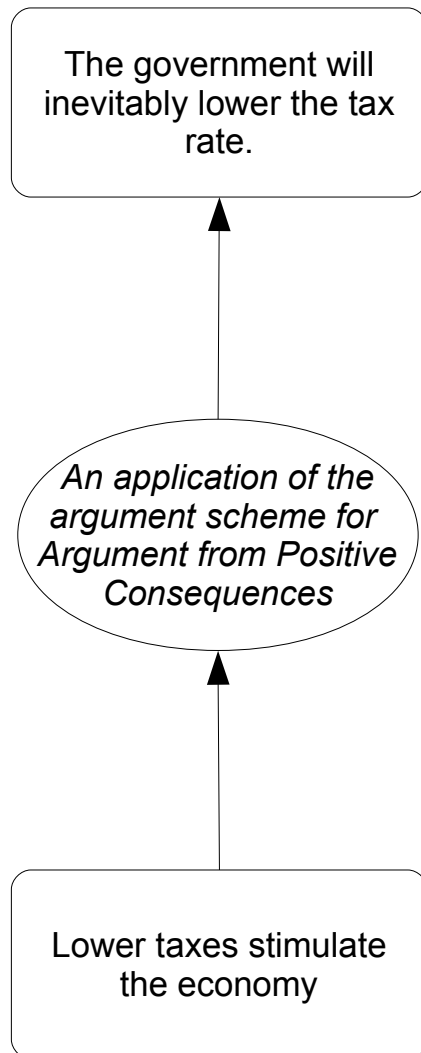


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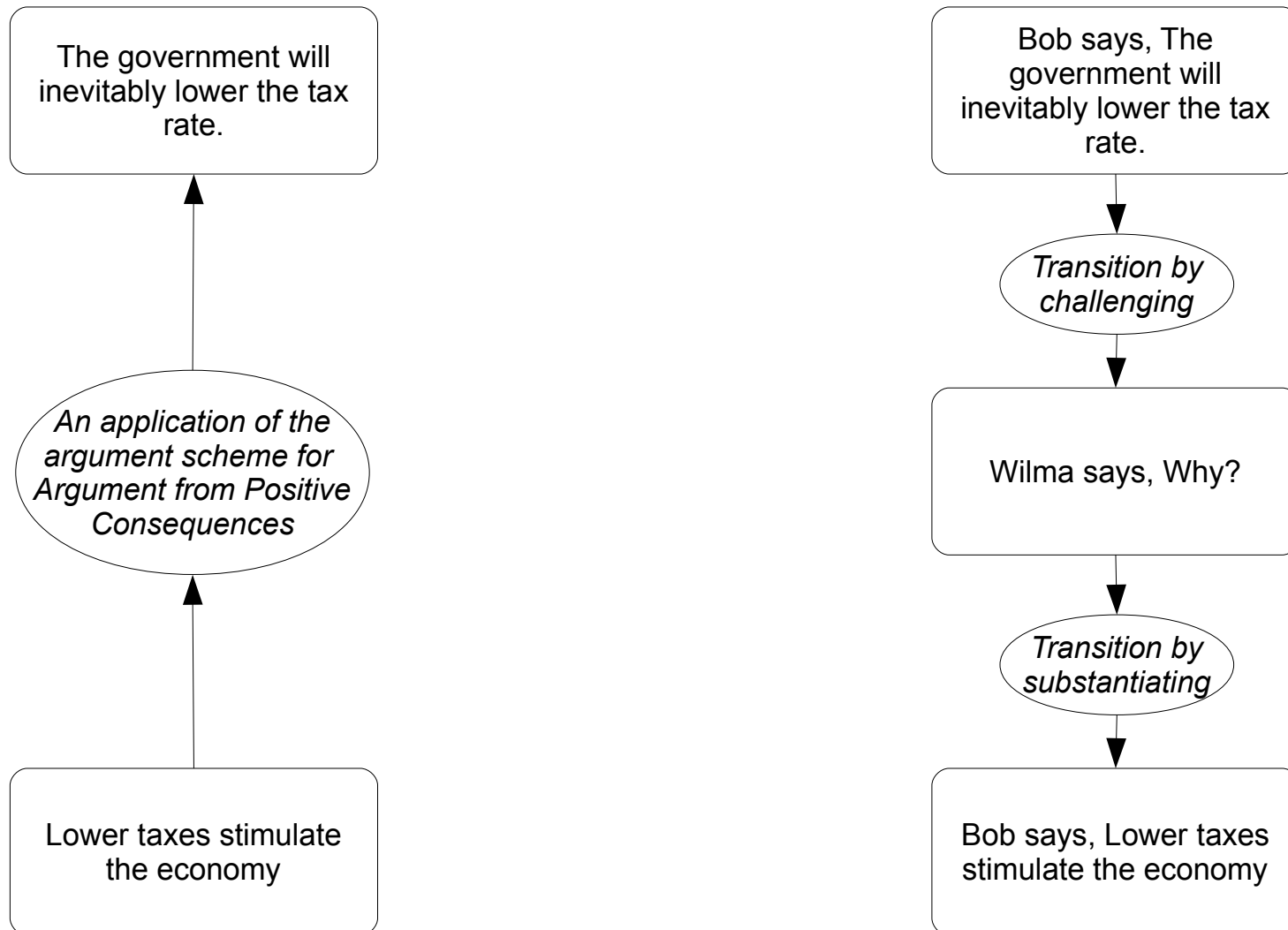


Why?

1st Type and 2nd Type



Big Question: Whence inference?



3rd Type: Illocutionary structures

- Inference structures: logic & argumentation theory
- Dialogical structures: dialectical theories & dialogue systems
- Illocutionary structures: speech act theory

Taxonomy of illocutions (Bach and Harnish 1979)

1. assertives: S's **belief**

- e.g. claiming, conceding, testifying, deducing, arguing, denying, criticizing, rebutting

2. directives: S's desire about a **possible future H's act**

- e.g. asking, commending, requesting, advising

3. commissives: **S's intention to do** something

- e.g. promising, threatening, offering

4. acknowledgments: **feelings** toward H

- e.g. apologizing, congratulating, thanking

Constitutive rules (Searle 1969)

1. Propositional content rules

- some illocutions can only be achieved with an appropriate propositional **content**
- **e.g.** a promise may refer only to what is in the future and under the control of a speaker

2. Preparatory rules

- determine what a speaker **presupposes** in performing a speech act
- **e.g.** a speaker cannot marry a couple unless he is legally authorized to do so

Constitutive rules (Searle 1969)

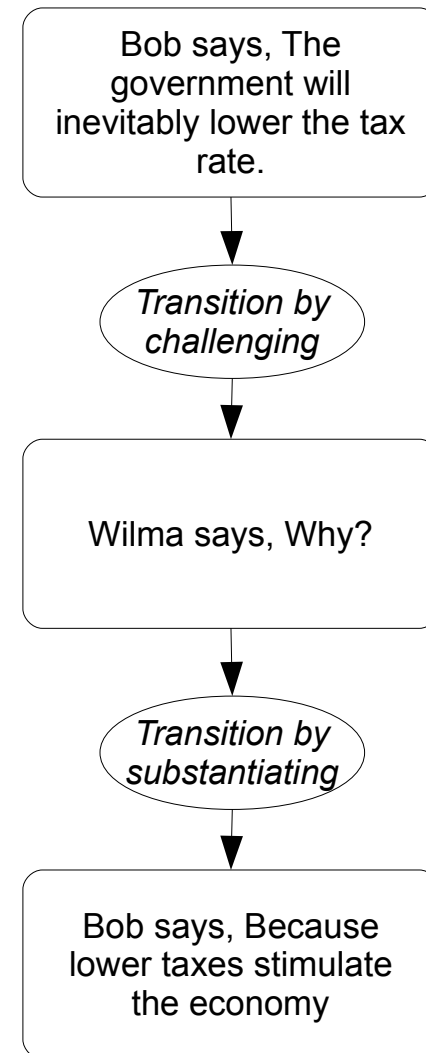
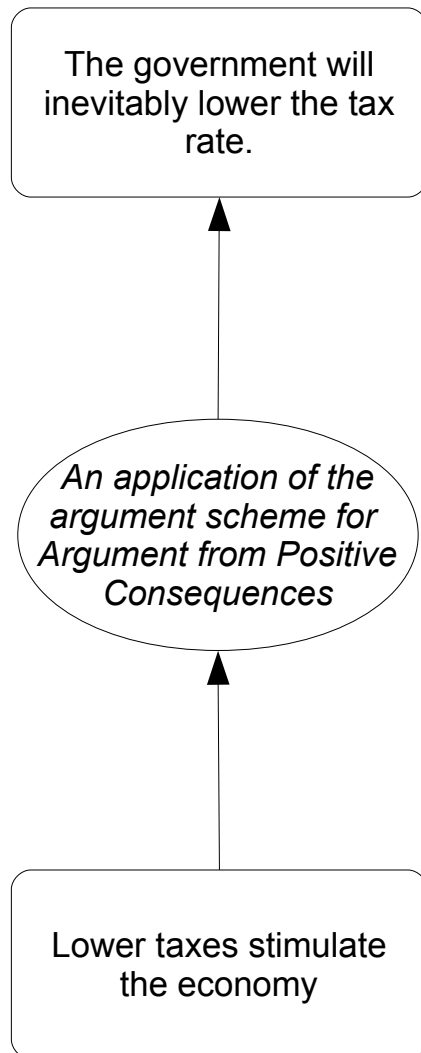
3. Sincerity rules

- tell what **psychological state** is expressed
- **e.g.** an assertion expresses belief, a promise expresses an intention to do something
- a speech act is sincere only if a speaker is actually in this state

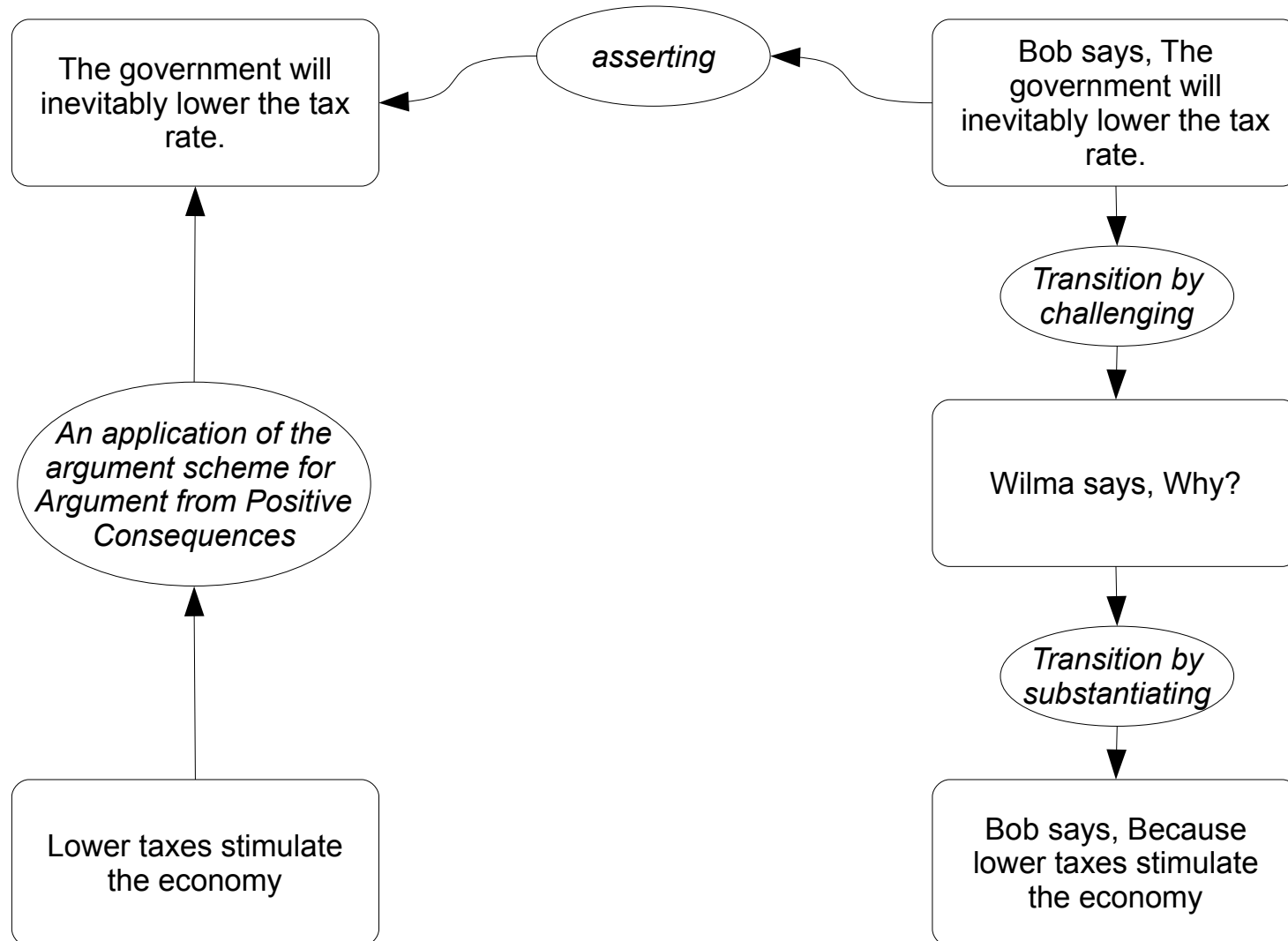
4. Essential rules

- determine what a speech act **consists in** essentially
- **e.g.** a promise commits a speaker to perform an act expressed in a propositional content

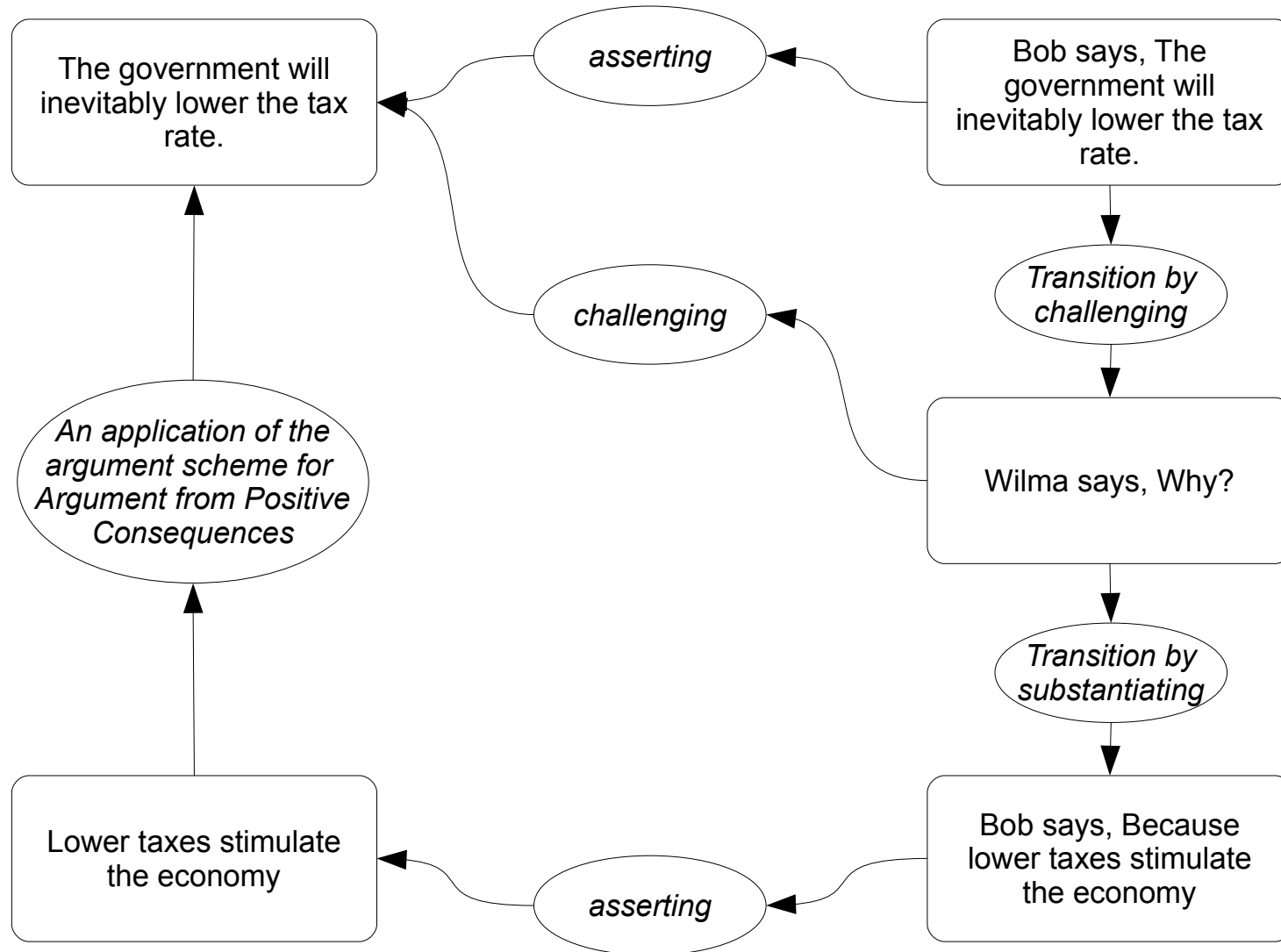
3rd Type: Illocutionary structures



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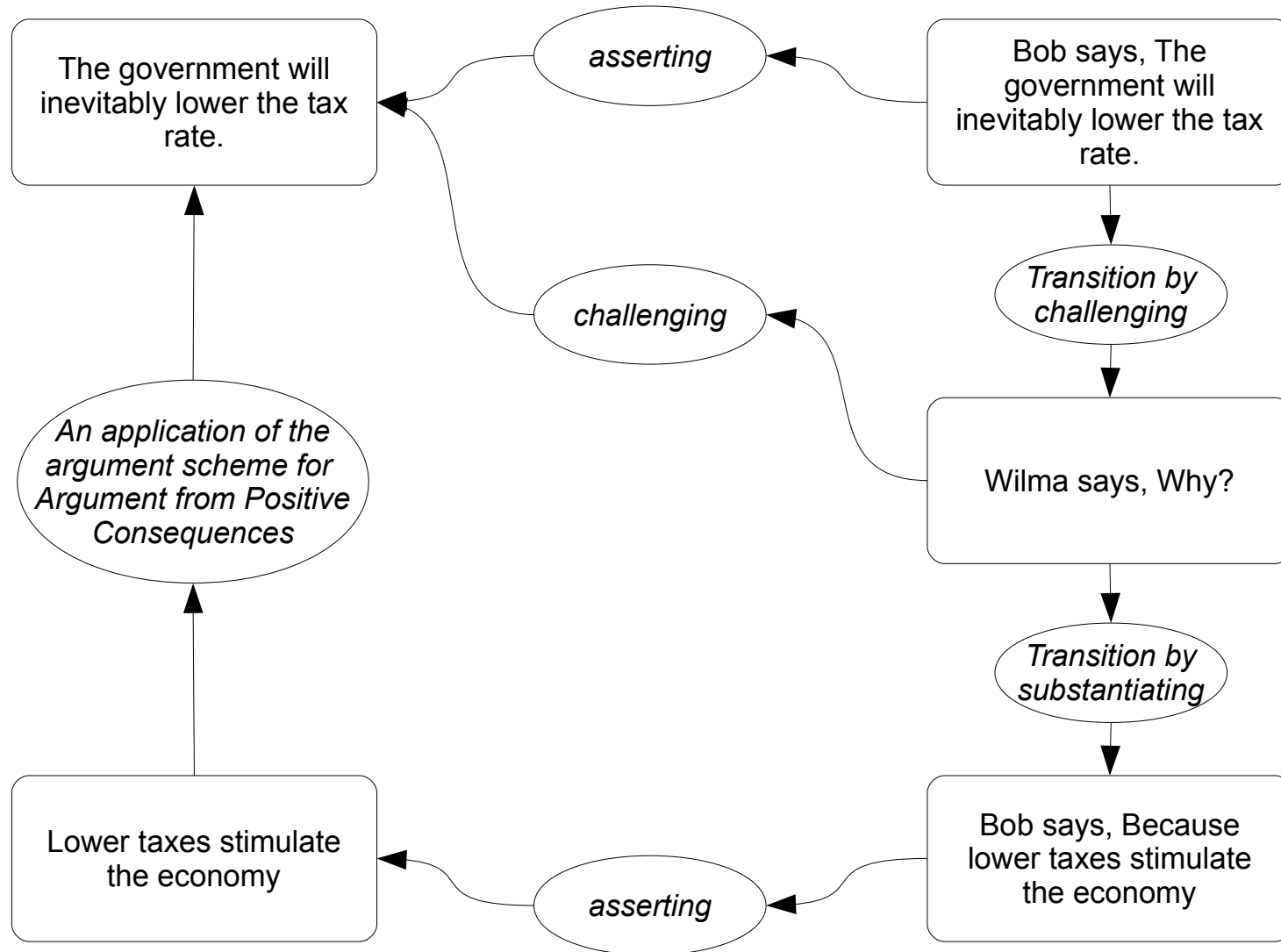


3rd Type: Illocutionary structures



What about BQ?

Whence inference?



Speech Act of Arguing

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For pragma-dialectics, *argue(s)* is performed in virtue of performing *assert(s)*.

- But this leaves the inferential action *argue(s)* as an intrinsic property of (1.3).

Speech Act of Arguing

(Ex1)

(1.1) Bob says, The government will inevitably lower the tax rate.

(1.2) Wilma says, Why?

(1.3) Bob says, Lower taxes stimulate the economy.

We need to recognise the dialogical relationships between (1.1) – (1.3), and at the same time recognise the inferential relationships between their contents, without making those relationships intrinsic to single moves.

Dialogue Glue

(Ex2)

- (2.1)** Bob says, The government will inevitably lower the tax rate.
- (2.2)** Bob says, After all, lower taxes stimulate the economy.
- (2.3)** Bob says, They ease cash flow for small business.
- (2.4)** Bob says, And anyway, lower taxes are a sure-fire vote winner.

Dialogue Glue

(Ex2)

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(2.4) Bob says, And anyway, lower taxes are a sure-fire vote winner.

Functional relationships of *supporting* between (2.1) and (2.2); (2.2) and (2.3); and (2.1) and (2.4) – no dependence upon consecutiveness.

Transitions as Implicit Speech Acts

- Notice that propositional reports of speech acts always refer to **explicit** speech acts
- Notice too that, as yet, we don't have speech acts corresponding to arguing
- Argument is created, invoked, invited or established not (intrinsically) by virtue of the explicit speech act associated with a premise...

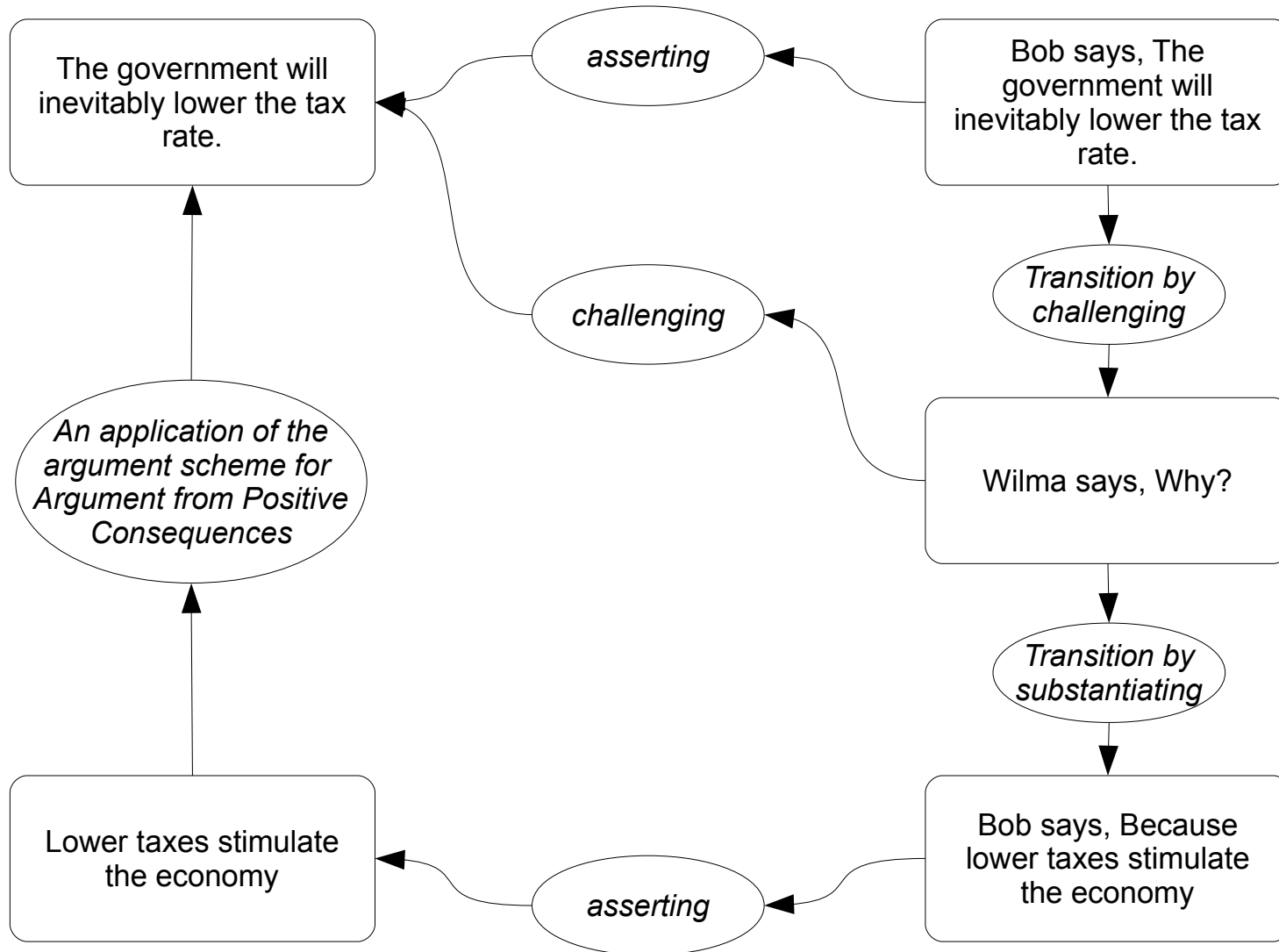
Transitions as Implicit Speech Acts

- ...but rather, by virtue of the fact that one is responding to a challenge
- i.e. by virtue of the transition between a *Why?* and its substantiating reply
- i.e. by virtue of the transition of substantiating
- i.e. the transition of substantiating constitutes the speech act of arguing
- ergo, the transition of substantiating is an **implicit** speech act (mostly)

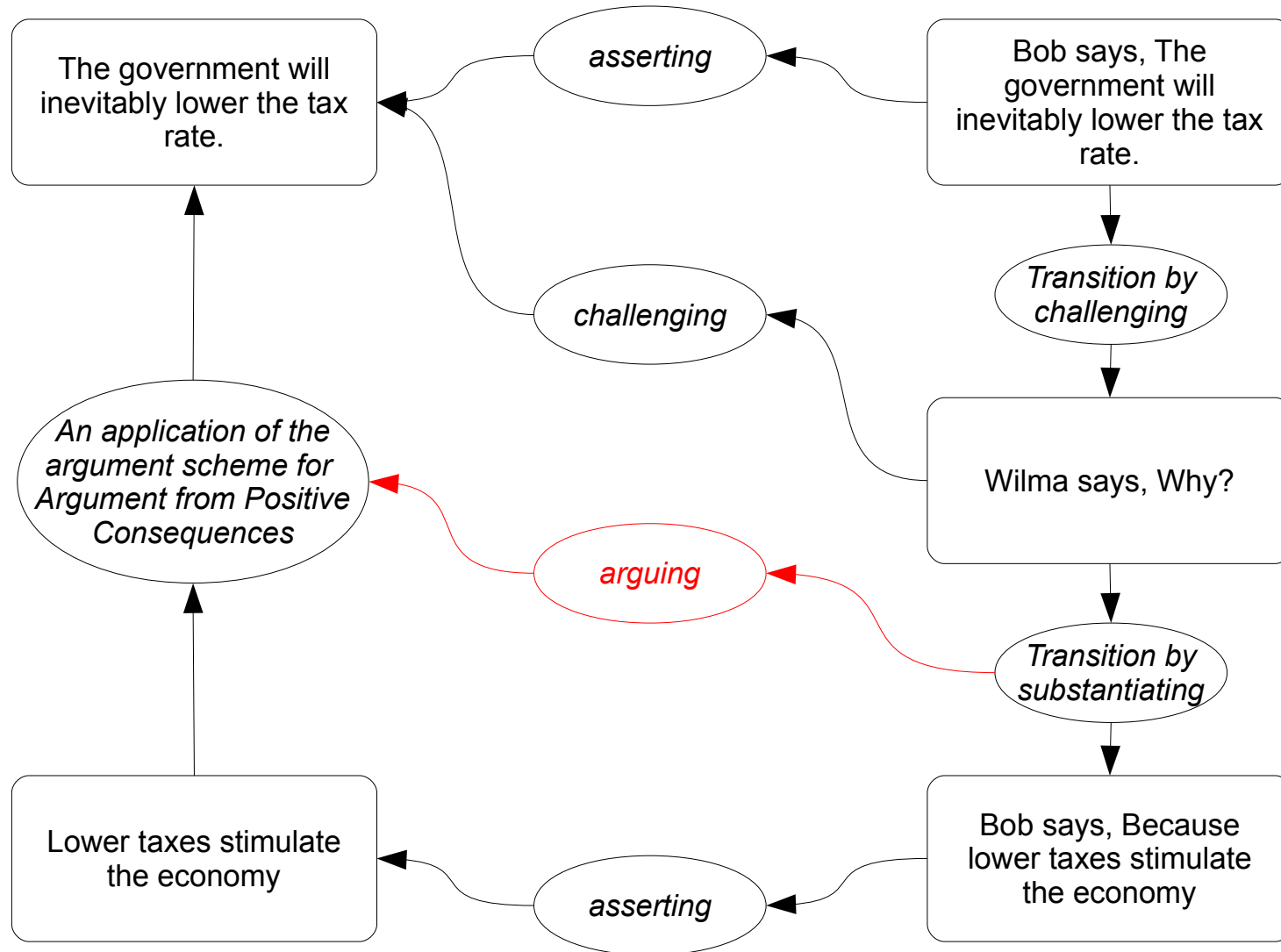
Transitions as Implicit Speech Acts

- Two caveats:
 - Some linguistic material might be said to be associated with such 'implicit' speech acts (for example, *because*)
 - We are talking here about **implicit speech acts** and NOT indirect speech acts (the two distinctions are orthogonal)

So again: Whence inference?



Inference Anchoring



4th Type: Ethotic structures

Means of persuasion (Aristotle's Rhetoric):

- Logos – argumentation (propositional content)
- Ethos – **character of the speaker** (credibility, trustworthiness, etc.)
- Pathos – emotional states of the hearer

4th Type: Ethotic structures

1. Propositional content rules

- **e.g.** a promise may refer only to what is in the future and under the control of a speaker

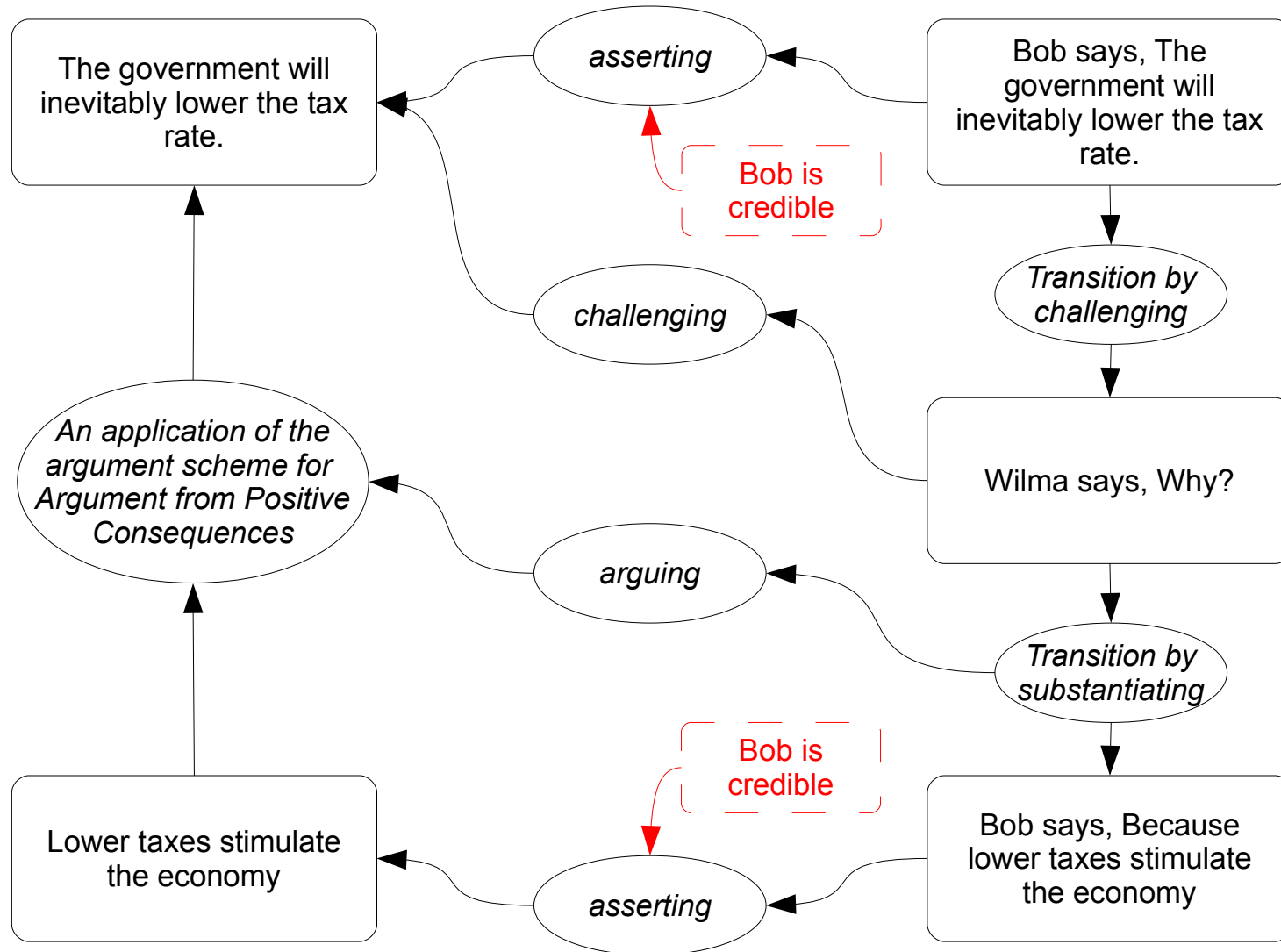
2. Preparatory rules

- **e.g.** a **speaker** cannot marry a couple unless he is legally authorized to do so

3. Sincerity rules

- **e.g.** an assertion expresses **speaker's** belief, a promise expresses an intention to do something

4th Type: Ethotic structures



Conclusions

- **Inference** structures: logic & argumentation theory
- **Dialogical** structures: dialectical theories & dialogue systems
- **Illocutionary** structures: speech act theory
- **Ethotic** structures: rhetorics & speech act theory (constitutive rules)



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Argumentation Research Group



Katarzyna Budzynska
IFiS PAN, Warsaw, Poland
ARG-tech, U Dundee, Scotland
budzynska.argdiap@gmail.com
argdiap.pl

Chris Reed
ARG-tech, U Dundee, Scotland
chris@computing.dundee.ac.uk
arg.dundee.ac.uk