

# From *zero* to bigger things: numerosity, intensification, and NPI licensing\*

Sherry Yong Chen (MIT)

CLS54 | April 28, 2018

## Big-picture questions

- Are all numerals alike? Can we give them a unified semantics?
- What's the analytical connection between plural and degree semantics?

## Roadmap

- I report novel data which sets *zero* apart from other numerals in terms of
  - ◊ Directly modifying (uncountable) nominal degree predicates
  - ◊ Giving rise to intensifying effects
- I offer an analysis of *zero* as a degree quantifier which
  - ◊ Explains its NPI licensing possibilities based on additional syntactic considerations
  - ◊ Embarks on a pragmatic account of the intensifying effects
- Finally, I discuss
  - ◊ How my account compares with the numeral *zero* argued in Bylina & Nouwen (2017)
  - ◊ Whether a unified semantics of *zero* is possible

## 1 *Zero* and nominal degree predicates

- *Zero* can directly modify what I will call *nominal degree predicates*, which typically denote abstract concepts, often have a degree adjective counterpart, and are mostly uncountable<sup>1</sup>:

- (1) a. Mary has *zero/no* tolerance for betrayal.  
b. Mary has \*one tolerance for betrayal.

---

\*I thank Roger Schwarzschild for his kind guidance and for having numerous discussions with me on this material. Thank you to E. Matthew Husband for sparking my interest in *zero*. Thanks also go to Lucas Champollion, Martin Hackl, Irene Heim, Filipe Hisao Kobayashi, Benjamin Spector, and the reviewers and audience of CLS54 for their insightful comments. All remaining errors are mine.

<sup>1</sup>See the Appendix for more examples from Corpus of Contemporary American English (COCA).

- (2) a. Jack showed *zero/no* interest in physics.  
b. Jack showed \*one interest in physics.
- (3) a. John has *zero/no* confidence in winning the game.  
b. John has \*two confidence(s) in winning the game.
- (4) a. Anne demonstrated *zero/no* sense of fashion.  
b. Anne demonstrated \*three sense(s) of fashion.

- ◇ No other numerals can directly modify these nouns. This is somewhat surprising if *zero* is simply a numeral.
- ◇ In these cases, *zero* is interchangeable with the negative quantifier *no*.
- ◇ Intuitively, *zero* seems to be expressing the (precise) degree of a nominal predicate. We would like to pursue this intuition.

- When modifying nominal degree predicates, *zero* is subject to different modification possibilities than other numerals.

- ◇ *Zero* is infelicitous with certain comparative expressions, e.g. *more than* and *over*. Other numerals are perfectly fine.

- (5) a. ??Mary has more than *zero* confidence in this contest.  
b. Susan certainly has more than ten publications!

- (6) a. #Vera has over *zero* tolerance for betrayal.  
b. Over ten students came to the lecture today.

- ◇ *Zero* can be modified by *absolutely*. Other numerals cannot.

- (7) a. Naomi has absolutely *zero* interest in physics.  
b. #John purchased absolutely five jackets!

- ◇ This is consistent with the intuition that *zero* is contributing to something other than cardinal evaluation.

- Cross-linguistic data also suggests that when *zero* modifies a nominal degree predicate, it is rather unusual as a numeral.

- ◇ In Brazilian Portuguese<sup>2</sup>, *zero* is the only numeral that can (1) directly modify nominal degree predicate, and (2) appear either before or after the nominal degree predicate it modifies.

---

<sup>2</sup>I thank Filipe Hisao Kobayashi for providing the data.

- (8) a. Oliver tá com (*zero*) confiança (*zero*).  
 Oliver be.3SG with zero confidence zero  
 ‘Oliver has zero confidence.’
- b. Maria tem *zero* publicações (*\*zero*)  
 Maria have.3SG zero publications zero  
 ‘Maria has zero publications.’

**Take-away:** *Zero* behaves as a rather unusual numeral when modifying nominal degree predicates; it patterns with *no* and adjectives.

## 2 *Zero* Intensification: two observations

- *Zero* shows intensifying effects in a way that no other numerals do.

### 2.1 Ordering restriction in intensification

- With typical intensifiers, the intensified form must follow the unintensified form:

- (9) a. “He is good, *very* good,” Bercow says. (The Guardian, 25 May 2014)  
 b. #“He is *very* good, good.”

- (10) a. (The) Iraq vote is close, *real* close. (Politico, 23 March 2007)  
 b. #The Iraq vote is *real* close, close.

- This pattern shows up in various types of intensification strategies, e.g. reduplication:

- (11) a. But he was crazy about her. Like *crazy crazy*. (Discretion: A Novel, p. 323)  
 b. #But he was *crazy crazy* about her. Like crazy.

- A parallel observation: the ordering between *no*-NP and *zero*-NP also appears to be fixed:

- (12) a. There is no chance, *zero* chance, that the US would be sued on something  
 like our financial regulations. (Barack Obama, 10 May 2015)  
 b. #There is *zero* chance, no chance, that the US would be sued ...

◊ There are many naturally-occurring examples in the wild that conform to this pattern:

- (13) The justice department revealing it has found no evidence, *zero* evidence that  
 Donald Trump tower was ever wire-tapped ... (CNN, 2 September 2017)

- (14) ... we have no information – *zero* information – about the base rate prevalence of  
 lying in the general public. (Journal of Law and Health, 2009)

- These data show that *zero*-NP is somehow more intensified than *no*-NP. But how?

## 2.2 Conjunction with anonymous adjectives

- The unintensified form of a degree adjective is compatible with the negation of the intensified form (Beltrama & Bochnak, 2015; Bylinina & Sudo, 2015):

(15) La torre è alta ma non alt-*issima*.  
the tower is tall but not tall-INTENSIFIER  
'The tower is tall but not extremely tall.' (Beltrama & Bochnak, 2015, p. 848)

(16) The journalists are honest, but not *100%* honest.

- *Zero* also has an intensifier use, but only with downward monotonic degree adjectives, i.e. “anonymous adjectives” that are on a “reversed” scale (Morzycki, 2009; Rett, 2017):

(17) McEwen is cautious about the chances of seeing the missing lander this way, giving it a “*small but not zero*” chance of success. (Nature, May 14th 2008)

(18) Travelers who ... have no measured fever, and have been determined to have *low, but not zero* risk will be released. (Virginia Department of Health)

(19) At this point, we conclude that we find *weak, but not zero* evidence of a triangular arbitrage role ... (Handbook of Asian Finance, p. 203)

- Numerals don't conjoin with most adjectives. Why is *zero* singled out in the above cases?

(20) #I want five and small cups.

(21) #This team consists of weak but not two players.

## 3 *Zero*: NPI Licensing?

- Numerals normally don't license NPIs<sup>3</sup>.
- Based on the following examples from *zero* and plural count nouns, Bylinina & Nouwen (2017, p. 21) argue that *zero* does not license even weak NPIs:

(22) *No/\*Zero* students ever said anything.

(23) *No/\*Zero* students bought any car.

- ◊ This is not quite empirically adequate.
- ◊ A confound: all of the examples above have *zero*-NP in the subject and the NPI in the nuclear scope of *zero*.

---

<sup>3</sup>For discussions about *exactly n* with low numerals licensing NPIs in restricted environments, see Linebarger (1987), Nishiguchi (2004), Rothschild (2006), Gajewski (2008), and Crnić (2014), a.o.

- ◊ The *zero* that modifies plural count nouns can actually license NPIs in its restrictor:<sup>4</sup>
- (24)
- a. Julia has *no/zero* publications in anything related to linguistics.
  - b. Adding “write a book” to your to-do list will result in *no/zero* books ever being written.
  - c. *No/Zero* students from any European country came to the conference.
- How about the *zero* that modifies nominal degree predicates?
    - ◊ It seems to be able to license (weak) NPIs in both its restrictor and nuclear scope:
- (25)
- a. There is *no/zero* tolerance for any lying, stealing, or cheating.
  - b. Kara showed *no/zero* interest in anything to do with boys.
  - c. John has *no/zero* chance of ever becoming the President of the United States.
- (26)
- a. *No/Zero* information was ever released to anyone outside the company.
  - b. *No/Zero* evidence ever existed proving I was wrong.
  - c. There was *no/zero* privacy anywhere in this house.
- Why does this *zero* show more NPI licensing possibilities?
  - What do we make of the contrast between the two *zeros* in terms of NPI licensing?

#### 4 The Analysis

- Treating *zero* as a regular numeral will leave many of our observations unexplained.
  - ◊ Why is *zero* not sensitive to the countability of the nominal degree predicate?
  - ◊ Why can *zero* be conjoined with adjectives?
- Can we analyze *zero* as its close cousin, the negative generalized quantifier *no*?
  - ◊ But then what do we do with the ordering restriction between *no*-NP and *zero*-NP?

	Zero	Numerals	No
Modifies gradable nouns	✓	×	✓
Combines with <i>more than/over</i>	×	✓	×
Combines with <i>absolutely</i>	✓	×	✓
Has an intensifier use	✓	×	×
Conjoins with adjectives	✓	×	??
Licenses NPIs in the restrictor	✓	✓	✓
Licenses NPIs in the nuclear scope	✓	×	✓

Table 1: Comparison between degree-modifying *zero/numerals/no*

---

<sup>4</sup>I thank Roger Schwarzschild and Irene Heim for pointing out some of the initial observations and discussing them with me.

#### 4.1 *Zero* semantics: a degree quantifier

- I propose a degree quantifier analysis of *zero*.
  - ◊ Nominal degree predicates have a degree argument as well as some relevant dimension of measurement baked in their semantics (e.g. Larson, 1998; Heim, 2006).
  - ◊ Following Morzycki (2009), a gradable noun denotes a measure function from individuals to some degree.

$$(27) \quad \llbracket N_{\langle d,et \rangle} \rrbracket = \lambda d. \lambda x. P(x) \wedge \mu_S(x) \geq d$$

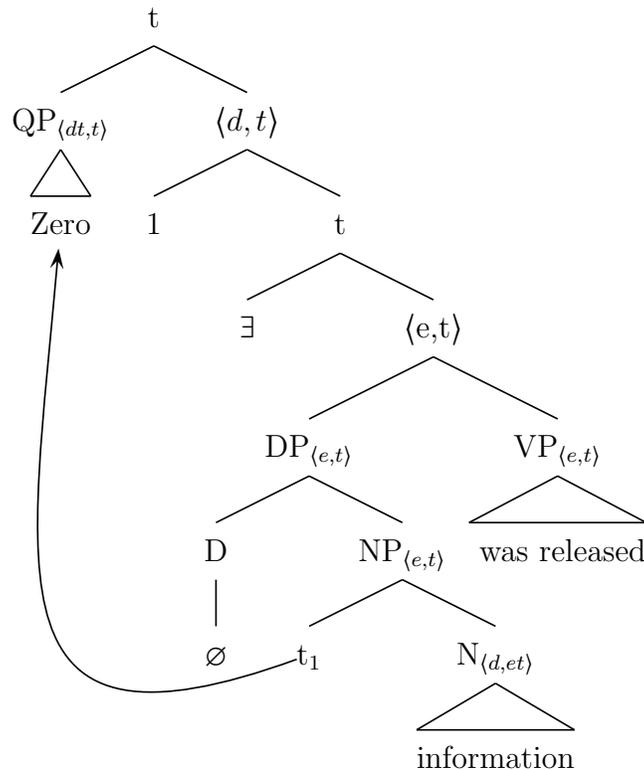
$$(28) \quad \llbracket \text{information} \rrbracket = \lambda d. \lambda x. x \text{ is information and the amount of } x \text{ is no less than } d$$

- *Zero* is a degree quantifier of type  $\langle dt, t \rangle$ . The lexical entry of *zero*<sup>5</sup>:

$$(29) \quad \llbracket zero_{\langle dt,t \rangle} \rrbracket = \lambda I_{\langle d,t \rangle}. \forall d > \mathbf{0} [\neg I(d)]$$

- ◊ The predicate *I* is false of all degrees that are greater than  $\mathbf{0}$ .

- Taking “*zero* information was released” as a simple example, I postulate the following syntactic structure for a *zero*-sentence.



<sup>5</sup>This degree quantifier analysis of *zero* relates closely to Alrenga & Kennedy’s (2014) analysis of *no*, a negative element assumed in their analysis of comparative clauses:  $\llbracket \text{no}_{max} \rrbracket = \lambda P_{\langle d,t \rangle}. \max(P) = \mathbf{0}$ . Thank you to Reviewer #3 for pointing this out.

Since N takes a degree as its argument and *zero* is a degree quantifier, *zero* will have to QR, leaving behind a trace of type  $d$ .

- Below is one way of implementing the compositional analysis. Compositional rules involved here include: functional application (**FA**), predicate modification (**PM**), predicate abstraction (**PA**), and **Existential Closure** ( $\exists\text{C}$ ) (Heim & Kratzer, 1998; Solt, 2015).

$$\begin{aligned}
\llbracket [_{DP} \emptyset t_1 \text{ information}] \rrbracket &= \llbracket N \rrbracket (d_1) \\
&= \lambda x. \text{information}(x) \wedge \mu_S(x) \geq d_1 && \text{by FA} \\
\llbracket [_{IP} \emptyset t_1 \text{ information was released}] \rrbracket &= ( \llbracket t_1 \text{ information} \rrbracket ) ( \llbracket \text{was released} \rrbracket ) \\
&= \lambda x. \text{information}(x) \wedge \mu_S(x) \geq d_1 \wedge \text{released}(x) && \text{by PM} \\
&\Rightarrow \exists x[\text{information}(x) \wedge \mu_S(x) \geq d_1 \wedge \text{released}(x)] && \text{by } \exists\text{C} \\
&\Rightarrow \lambda d_1. \exists x[\text{information}(x) \wedge \mu_S(x) \geq d_1 \wedge \text{released}(x)] && \text{by PA} \\
\llbracket [_{QP} \text{ zero}] \rrbracket &= \llbracket \text{zero} \rrbracket = \lambda I_{(d,t)}. \forall d > \mathbf{0}[\neg I(d)] \\
\llbracket [_{IP}[\text{zero}][\emptyset t_1 \text{ information was released}]] \rrbracket & \\
&= \lambda I_{(d,t)}. \forall d > \mathbf{0}[\neg I(d)](\lambda d_1 \exists x[\text{information}(x) \wedge \mu_S(x) \geq d_1 \wedge \text{released}(x)]) \\
&= \forall d > \mathbf{0}[\neg \exists x[\text{information}(x) \wedge \mu_S(x) \geq d \wedge \text{released}(x)]] && \text{by FA}
\end{aligned}$$

- Given the truth condition, the sentence *zero information was released* is true *iff* the amount of information that was released is  $\mathbf{0}$ .
- This requires including  $\mathbf{0}$  as the endpoint of the degree scale.

## 4.2 Zero syntax: NPI licensing explained

- Observation 1: We observe that the degree quantifier *zero* seems to license an NPI in both its restrictor and nuclear scope<sup>6</sup>.

- (30)
- a. There is *no/zero* tolerance for any lying, stealing, or cheating
  - b. Kara showed *no/zero* interest in anything to do with boys.
  - c. John has *no/zero* chance of ever becoming the President of the United States.
- (31)
- a. *No/Zero* information was ever released to anyone outside the company.
  - b. *No/Zero* evidence ever existed proving I was wrong.
  - c. There was *no/zero* privacy anywhere in this house.

◇ Question 1: How is this captured in our account?

◇ I will focus on fleshing out some of the key predictions based on the semantics analysis.

---

<sup>6</sup>Unlike *no*, the degree quantifier *zero* never really licenses strong NPIs, e.g. *in years*. This may suggest that *zero* is never a sentential negation like *no*, but I don't have anything further to add at this point.

- Observation 2: The licensing is subject to locality conditions and intervention effects:

- (32)
- Kara showed *zero* interest in anything to do with boys.
  - ??Kara showed *zero* interest in the lecture which has anything to do with quantum chromodynamics. (Complex NP)
  - ??Kara showed *zero* interest in anything to do with boys and the lecture on quantum chromodynamics. (Coordinate Structure Constraint)
  - \*Kara showed *zero* interest in every lecture that has anything to do with quantum chromodynamics. (Intervener: *every*)

- ◇ Question 2: Are these restrictions on licensing due to particular requirements of a DE licenser or structural configurations (or both)?
- ◇ Several existing accounts: a semantic/pragmatic approach (Krifka, 1995; Chierchia, 2004), and a syntactic/movement-based approach (Guerzoni, 2006).
- ◇ The relevance of intervention effects will become clear later.

#### 4.2.1 The 123 of NPI licensing

- Common/Basic assumptions about the conditions on NPI licensing:
  - ◇ (i) It is environment based (Heim, 1984; Zwarts, 1996; Gajewski, 2005).
  - ◇ (ii) (Strawson) Downward entailment (DE) is the central notion of a theory of licensing (Ladusaw, 1980; Progovac, 1993; Lahiri, 1998; von Stechow, 1999; a.o.).
  - ◇ (iii) DE-ness can be defined across syntactic categories.
- Our semantics for *zero* predicts that it creates a (non-trivial) DE environment in both its restrictor and nuclear scope:

(33)  $\llbracket \text{important information} \rrbracket \subseteq \llbracket \text{information} \rrbracket$

- Zero* information was released.  
 $\Rightarrow$  *Zero* important information was released.
- $\forall d > \mathbf{0}[\neg\exists x[\text{information}(x) \wedge \mu_S(x) \geq d \wedge \text{released}(x)]]$   
 $\Rightarrow \forall d > \mathbf{0}[\neg\exists x[\text{information}(x) \wedge \text{important}(x) \wedge \mu_S(x) \geq d \wedge \text{released}(x)]]$

(34)  $\llbracket \text{student linguists} \rrbracket \subseteq \llbracket \text{linguists} \rrbracket$

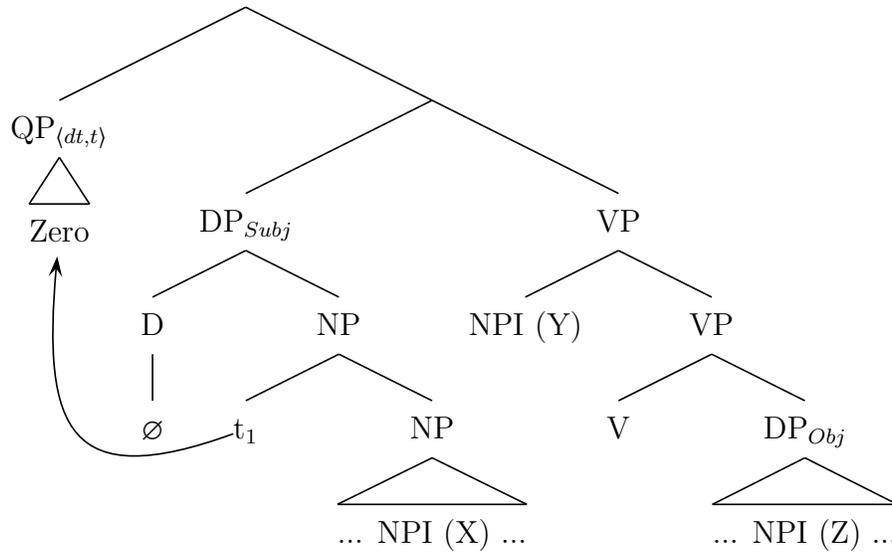
- Zero* information was released to the linguists.  
 $\Rightarrow$  *Zero* information was released to the student linguists.
- $\forall d > \mathbf{0}[\neg\exists x[\text{information}(x) \wedge \mu_S(x) \geq d \wedge \exists y[\text{released}(y)(x) \wedge \text{linguist}(y)]]]$   
 $\Rightarrow \forall d > \mathbf{0}[\neg\exists x[\text{information}(x) \wedge \mu_S(x) \geq d \wedge \exists y[\text{released}(y)(x) \wedge \text{linguist}(y) \wedge \text{student}(y)]]]$

### 4.2.2 Sketching a structural analysis for NPI licensing

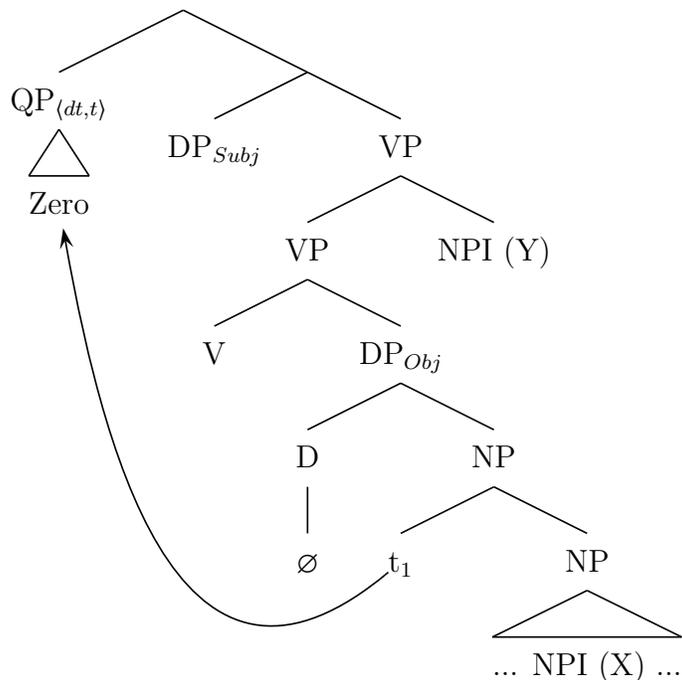
- I offer a structural analysis for our *zero*, to be contrasted with the numeral *zero*.

**Proposal:** The degree quantifier *zero* itself – rather than *zero*-NP – is the licenser. It licenses an NPI in the restrictor as well as the nuclear scope at LF, after QR applies.

- (35) *Zero* in the subject position:  $[_{TP} [_{DP} [Zero [_{NP} \dots X \dots ]]] [_{VP} \dots Y \dots [_{DP} \dots Z \dots ]]]$   
 NPI licensing position: X, Y, Z



- (36) *Zero* in the object position:  $[_{TP} [_{DP} \dots ] [_{VP} \dots [_{DP} [zero [_{NP} \dots X \dots ]]] \dots Y \dots ]]$   
 NPI licensing position: X, Y



- QR interacts with NPI licensing. Antecedent-Contained Deletion (ACD) provides independent evidence for this interaction (Merchant, 2000):

- (37) a. John didn't admit to being interested in any of the movies that Mary did.  
 b. \*John denied being interested in any of the movies that Mary did.

- ◊ Both sentences have an ACD site hosted by a DP projected from *any*, an NPI item.
- ◊ *Any*-NP has to QR for ACD resolution: in (a), it can target a landing site right below *not*; in (b), it will have to fall outside the scope of *deny*.

### 4.3 Zeroing in on the intensifying effects

- What about the intensifying effects?
  - ◊ The ordering restriction: *no*-NP, *zero*-NP
  - ◊ Conjunction with antonymous adjectives: *small but not zero* chance

#### 4.3.1 Zero as a stronger scalar alternative

- Hypothesis: *Zero* is a stronger scalar alternative to antonymous adjectives and *no*.
- Recall the ordering restriction:

- (38) a. There is no chance, *zero* chance, that the US would be sued on something like our financial regulations.  
 b. #There is *zero* chance, no chance, that the US would be sued on something like our financial regulations.

- ◊ The above contrast is reminiscent of the ordering restrictions on lexical alternatives (e.g. Levinson, 2000; Chierchia, 2004; Sauerland, 2012); The following (b) example is infelicitous because the stronger alternative entails the weaker alternative:

- (39) a. The water is cold. In fact, it is freezing.  
 b. #The water is freezing. In fact, it is cold.

- The conjunction between *zero* and an antonymous adjective also bears interesting similarity with adjectives that are scalar alternatives:

- (40) a. a *small but not zero* chance, *low but not zero* risk, *weak but not zero* evidence  
 b. a *small but not tiny* ball, a *big but not huge* tree, a *weak but not wasted* muscle

- *Zero* is a stronger scalar alternative to antonymous adjectives on different dimensions.

### 4.3.2 *Zero* is not subject to domain restriction

- Can we generalize this idea to explain the ordering between *no*-NP and *zero*-NP?
    - ◊ Not quite. *No* and *zero* can't be scalar alternatives.
    - ◊ The difference between *no* and *zero* is not truth conditional.<sup>7</sup> Notice that the following example involves a contradiction:
- (41) #The justice department revealing it has found *no evidence*, *but not zero* evidence, that Donald Trump tower was ever wire-tapped ...
- ◊ But – there is no contradiction here:
- (42) The justice department revealing it has found *no good evidence*, *but not zero* evidence, that Donald Trump tower was ever wire-tapped.

**Idea:** *No* is subject to domain restriction, but *zero* does not have domain selection, because it is not a generalized quantifier.

- “*No* evidence” can pragmatically ambiguous in terms of precision.
  - ◊ From the speaker's perspective, “*no* evidence” and “*zero* evidence” are truth conditionally equivalent.
  - ◊ However, the hearer doesn't have in mind such a non-restrictive context: domain restriction allows *no* to be weakened, such that when a speaker says “*no* evidence”, this could be interpreted by the hearer as “*no* good evidence”.
- In order to be more precise, the speaker adds “*zero* evidence” – good or bad.
  - ◊ There's no longer any room for pragmatic ambiguity that needs clearing up.
  - ◊ That's how *zero*-NP can be more intensified than *no*-NP – “intensification” in terms of the precision of degree modification.

## 5 Two lives of *zero*?

- We have looked at the degree quantifier *zero*, which modifies nominal degree predicates and behaves like an unusual numeral.
- There's also another *zero*, which modifies plural count nouns and behaves rather like a regular numeral.
- Are they Clark Kent and Superman? Is *zero* leading a double life?

---

<sup>7</sup>Thank you to Reviewer #1 for pointing this out!

## 5.1 The numeral *zero*: Bylinina & Nouwen (2017)

- Focusing on plural count nouns, Bylinina & Nouwen (2017) point out several semantic differences between *zero* and *no*.

- ◊ *No* but not *zero* can appear in exceptive licensing and negative inversion (Déprez, 1999; Moltmann, 1995):

(43) *No*/\**Zero* students but Bill came.

(44) On *no*/\**zero* occasions did he mention my help.

- ◊ As we have seen, this *zero* can't license NPIs in its nuclear scope:

(45) *No*/\**Zero* students ever said anything.

(46) *No*/\**Zero* students bought any car.

- Bylinina and Nouwen's (2017) account:

- ◊ *Zero* shows weaker negative force and more flexible scope compared to *no*. It should be treated as a regular numeral rather than a generalized quantifier.
- ◊ Numeral semantics: a modificational approach to numerals + an *at least* meaning.

(47)  $\llbracket zero \rrbracket = \lambda x [ \#x \geq 0 ]$

- ◊ Their analysis for plural count predicates: denoting a full lattice structure, derived by the operator  $\times$  (distinct from the more familiar semi-lattice operator  $*$ ) which includes the bottommost element,  $\perp$ .
- ◊ Problem: This will generate trivial truth conditions, such that a *zero*-sentence is always trivially true.

(48) Any predicate  $\times P$  is true of  $\perp$ .

If  $x$  in *zero students* is  $\perp$ , then it must be true.

- ◊ Solution: EXH applies obligatorily to *zero*. Exhaustification is required even in DE environments where it is unexpected, because the semantics of *zero* is just as uninformative in DE environments as it is in UE environments.

(49)  $\llbracket \text{EXH } Zero \text{ students passed the test.} \rrbracket =$   
 $\exists x [ \#x \geq 0 \ \& \ \times \text{student}(x) \ \& \ \times \text{pass-the-test}(x) ]$   
 $\& \ \neg \exists y [ \#y > 0 \ \& \ \times \text{student}(y) \ \& \ \times \text{pass-the-test}(y) ]$

- How does B&N's account explain their NPI licensing data?

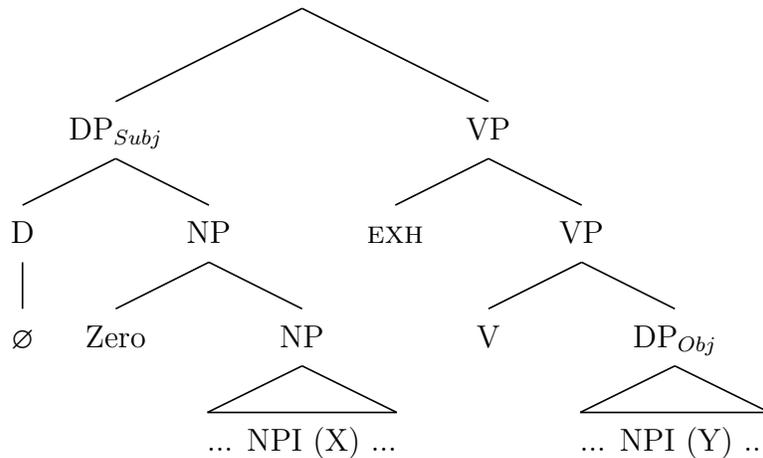
- ◊ Stipulating the following two licensing conditions for NPIs:

- (50) Given the structure  $[\alpha \text{ EXH } [\beta \dots [\gamma \text{ NPI } \dots]]]$   
 Condition 1: the environment  $\gamma$  is non-trivially DE in  $\beta$   
 Condition 2: the environment  $\gamma$  is non-trivially DE in  $\alpha$

- ◊ Given an *at least* semantics of *zero*,  $\gamma$  is not non-trivially DE in  $\beta$ , before EXH applies.
- ◊ Problem: This analysis will incorrectly rule out the cases where *zero* does actually license NPIs in its restrictor.

**New challenge:** Why does the numeral *zero* fail to license NPIs in its nuclear scope?

- Can we rescue B&N’s analysis by making minimal modifications to their proposal?
    - ◊ Keeping the *at least* semantics for *zero* and the application of EXH.
    - ◊ Recall the licensing between *zero* and an NPI is subject to intervention effects in [32].
    - ◊ We may assume that EXH applies at VP level, acting as an intervener between the licenser *zero* and an NPI in its nuclear scope.<sup>8</sup>
- (51) *Zero* in the subject position:  $[_{TP} [_{DP} [\text{Zero } [_{NP} \dots \text{X } \dots]]] \text{ EXH } [_{VP} \dots [_{DP} \dots \text{Y } \dots]]]$   
 NPI licensing position: X, \*Y



- Problem: This can explain that the NPIs won’t be licensed in the nuclear scope of the numeral *zero*, but it doesn’t fully capture how NPIs can be licensed in the restrictor, where *zero* still has an *at least* meaning before EXH applies.
- Idea: In order to explain the numeral *zero*’s failure of licensing an NPI in its nuclear scope as intervention effects, we still need an *exactly* semantics for *zero*. A possible candidate for the intervener could be the distributor operator DIST.

---

<sup>8</sup>I thank Yimei Xiang for suggesting this idea to me after the presentation.

- ◇ Prediction: If *DIST* obligatorily applies to *zero*, this would predict that the numeral *zero* cannot combine felicitously with collective predicates:

(52) ??Zero soldiers surrounded the castle.

- ◇ B&N reported unclear judgements for such examples.
- ◇ Native speakers that I’ve consulted find these examples ill-formed/only marginally acceptable, and it cannot be judged true in a scenario where no (group) individual satisfies the collective predicate (because collective predicates come with an existential entailment, see Buccola & Spector (2016))

## 5.2 Open ends

- We now have two meanings for *zero*: a numeral, and a degree quantifier.
- But postulating two meanings for *zero* seems like a less parsimonious result.
  - ◇ Can the numeral account explain the difference between *zero* and other numerals?
  - ◇ Can the degree quantifier analysis of *zero* be extended to plural count nouns, if we assume a degree argument for plural predicates (Cresswell, 1976; Rett, 2008)?
- Or perhaps we should keep the two meanings separate?

	Degree quantifier <i>zero</i>	Numeral <i>zero</i>
Modifies uncountable nouns	✓	??
Combines with <i>more than/over</i>	×	✓
Combines with <i>absolutely</i>	✓	??
Subject to domain restriction	×	×
Licenses NPIs in the restrictor	✓	✓
Licenses NPIs in the nuclear scope	✓	×

Table 2: Comparison between the degree quantifier *zero* and the numeral *zero*

## 6 From *zero* to bigger things: some implications

### 6.1 Scale boundary

- *Zero* and *100%* give rise to similar intensifying effects<sup>9</sup>:

(53) Google is good, but not 100% perfect.

<sup>9</sup>Most recently, Nouwen (2018, p.4) also points out that “maximizer” like *100%* and *completely* are sensitive to “there being an endpoint to the scale”. See also Kennedy & McNally (2005) for a discussion of the restricted distribution of proportional modifiers, e.g. *completely*, and in particular the use of the *max* function in their analysis which makes reference to scales with maximal values.

- ◊ *100%* is strikingly similar to *zero* in terms of the type of degree adjectives they can be conjoined with: *100%* + positive degree adjectives, *zero* + negative degree adjectives.
- ◊ Such a constraint contrasts with other intensifiers, e.g. *very* and *real*, whose scale is contextually determined by the null degree morpheme *POS* (Cresswell, 1976; Heim, 2006; Kennedy, 2007; von Stechow 2009; a.o.).
- Both *zero* and *100%* are at scale boundary, i.e. *zero* is the end of the numerical scale, whereas *100%* is at the (other) end of the percentage scale.
  - ◊ Being at scale boundary grants them the ability to function as intensifiers, and to exhibit the constraint on what type of degree adjectives they can conjoin with.
  - ◊ Related to “bounded scales” (Kennedy & McNally, 2005)
  - ◊ Demonstrating a close connection between numerosity and degrees.

## 6.2 Semantics and seemingly ontological oddity

- My analysis for *zero* as a degree quantifier involves including **0** to the endpoint of a degree scale, analogous to B&N’s move of adding a **0** element in a full lattice.
  - ◊ It is a move that has nontrivial consequences on our semantic theory<sup>10</sup>.
  - ◊ B&N (2017, p.2): “... the fact that languages allow ascription of zero quantity to an entity provides evidence that linguistic semantics has access to what at first sight may seem like an ontological oddity: an entity with *zero* quantity.”
  - ◊ We make the same ontological commitment: an entity with *zero* degrees/amounts.
- Is *zero* a “semantic virus” (Morzycki, 2017)?
  - ◊ Maybe. But the unusual behaviors *zero* exhibits could be due to there being two *zeros*: a numeral, and a degree quantifier.
  - ◊ What does it mean to be “at the corner of our language”? Do we have a principled way to decide what is at the core of language and therefore deserves theoretical attention?
  - ◊ Should I stop losing sleep over the weirdness of *zero*?

## 6.3 Take-home messages

- A closer analytical connection between plural and degree semantics
- A structural analysis suggesting that covert movement operations and intervening operators interacts with NPI licensing;
- Moving toward a more general theory of intensification

---

<sup>10</sup>See also Husband (2018) for applying B&N’s theory of plurality to the domain of events.

Appendix: Occurrences of *zero* with nominal degree predicates in COCA

- (54) The new website now contains *zero* information that is useful for me.
- (55) This position requires *zero* experience.
- (56) ... according to the standard SEL cut score resulted in *zero* sensitivity.
- (57) ... a great number of these titles received low to *zero* use.
- (58) There is *zero* tolerance for any lying, stealing or cheating.
- (59) ... these two separate things, whereas before, I had *zero* awareness of it.
- (60) There is *zero* evidence that the transmission of this messaging will effectively reduce harmful behavior
- (61) There is no chance, *zero* chance, that the US would be sued on something like our financial regulations.
- (62) There's absolutely *zero* doubt that this is the future. It's that simple.
- (63) I have *zero* problem eating a huge bowl by myself all in one sitting.
- (64) ... and their officials make sure to say there is *zero* tension and no disappointment in their relationship with the American president.
- (65) It's a dramatic monologue that contains *zero* drama, a series of questions that seek no answer ...
- (66) Thundersnow not out of the question. Near *zero* visibility. At times it will wrap up from west to east ...
- (67) Because it was outside the scope of the report, *zero* data was gathered on the difference in lane-splitting speeds and trauma suffered by people.
- (68) The Browns right now have *zero* credibility – not just with the national media but with the local.

## References

- Alrenga, P. & Kennedy, C. (2014). *No more shall we part: quantifiers in english comparatives*. *Natural Language Semantics*, 22(1), 1–53.
- Beltrama, A. & Bochnak, M. R. (2015). Intensification without degrees cross-linguistically. *Natural Language & Linguistic Theory*, 33(3), 843–879.
- Buccola, B. & Spector, B. (2016). Modified numerals and maximality. *Linguistics and Philosophy*, 39(3), 151–199.
- Bylinina, L. & Nouwen, R. (2017, May). On “zero” and semantic plurality. In *Proceedings of the 27th Semantics and Linguistic Theory Conference*. University of Maryland, College Park.
- Bylinina, L. & Sudo, Y. (2015). Varieties of intensification. *Natural Language & Linguistic Theory*, 33(3), 881–895.
- Chierchia, G. (2004). Scalar implicatures, polarity phenomena, and the syntax/pragmatics interface. In A. Belletti (Ed.), *Structure and beyond* (pp. 39–103). Oxford, UK: Oxford University Press.
- Cresswell, M. J. (1976). The semantics of degree. In B. H. Partee (Ed.), *Montague grammar* (pp. 261–292). New York: Academic Press.
- Crnič, L. (2014). Non-monotonicity in npi licensing. *Natural Language Semantics*, 22(2), 169–217.
- Déprez, V. (1999). The roots of negative concord in French and French based creoles. In M. DeGraff (Ed.), *Language creation and language change: creole, diachrony and development* (pp. 329–375). Cambridge, MA: MIT Press.
- von Stechow, K. (1999). NPI licensing, Strawson entailment, and context dependencies. *Journal of Semantics*, 16(2), 97–148.
- Gajewski, J. R. (2005). *Neg-raising: presupposition and polarity*. (Doctoral dissertation, Massachusetts Institute of Technology).
- Gajewski, J. R. (2008). NPI *any* and connected exceptive phrases. *Natural Language Semantics*, 16(1), 69–110.
- Guerzoni, E. (2006). Intervention effects on NPIs and feature movement: Towards a unified account of intervention. *Natural Language Semantics*, 14(4), 359–398.
- Heim, I. (1984). A note on negative polarity and downward entailingness. In C. Jones & P. Sells (Eds.), *Proceedings of the 14th North East Linguistic Society* (pp. 98–107). Amherst, MA: GLSA.
- Heim, I. (2006). Little. In M. Gibson & J. Howell (Eds.), *Proceedings of the 16th Semantics and Linguistic Theory Conference* (pp. 35–58). Ithaca, NY: CLC Publications.
- Heim, I. & Kratzer, A. (1998). *Semantics in generative grammar*. Malden, MA: Blackwell.
- Husband, E. M. (2018, January). Zero telicity and no results. In *Talk given at the Endpoints 2018 Workshop*. Humboldt-Universität zu Berlin. Berlin.
- Kennedy, C. (2007). Vagueness and grammar: the semantics of relative and absolute gradable adjectives. *Linguistics and Philosophy*, 30(1), 1–45.
- Kennedy, C. & McNally, L. (2005). Scale structure, degree modification, and the semantics of gradable predicates. *Language*, 81(2), 345–381.
- Krifka, M. (1995). The semantics and pragmatics of polarity items. *Linguistics Analysis*, 25(3-4), 209–257.

- Ladusaw, W. A. (1980). On the notion affective in the analysis of negative-polarity items. *Journal of Linguistic Research*, 1, 1–16.
- Lahiri, U. (1998). Focus and negative polarity in Hindi. *Natural Language Semantics*, 6(1), 57–123.
- Larson, R. K. (1998). Events and modification in nominals. In D. Strolovitch & A. Lawson (Eds.), *Proceedings of semantics and linguistic theory (SALT) 12*. Ithaca, NY: CLC Publications.
- Levinson, S. C. (2000). *Presumptive meanings: the theory of generalized conversational implicature*. Cambridge, MA: MIT Press.
- Linebarger, M. C. (1987). Negative polarity and grammatical representation. *Linguistics and Philosophy*, 10(3), 325–387.
- Merchant, J. (2000). Antecedents-contained deletion in negative polarity items. *Syntax*, 3(2), 144–150.
- Moltmann, F. (1995). Exception sentences and polyadic quantification. *Linguistics and Philosophy*, 18(3), 223–280.
- Morzycki, M. (2009). Degree modification of gradable nouns: size adjectives and adnominal degree morphemes. *Natural Language Semantics*, 17(2), 175–203.
- Morzycki, M. (2017). Some viruses in the semantics. In N. LaCara, K. Moulton, & A.-M. Tessier (Eds.), *A Schrifft to Fest Kyle Johnson* (pp. 281–292). University of Massachusetts, Amherst.
- Nishiguchi, S. (2004). Five types of affective contexts: Nonmonotonic NPI licensers. In *Proceedings from the 40th Annual Meeting of the Chicago Linguistic Society* (Vol. 1, pp. 249–263). Chicago, IL: Chicago Linguistic Society.
- Nouwen, R. (2018). A note on positive and negative evaluative adjectives. In *A festschrift for Dany Jaspers* (pp. 1–7).
- Progovac, L. (1993). Negative polarity: entailment and binding. *Linguistics and Philosophy*, 16(2), 149–180.
- Rett, J. (2008). *Degree modification in natural language*. (Doctoral dissertation, Rutgers The State University of New Jersey - New Brunswick).
- Rett, J. (2017, September). *The semantics of many, much, few, and little*. Unpublished manuscript, UCLA.
- Rothschild, D. (2006). Non-monotonic NPI-licensing, definite descriptions, and grammaticalized implicatures. In M. Gibson & J. Howell (Eds.), *Proceedings of the 16th Semantics and Linguistic Theory Conference* (pp. 228–240). Ithaca, NY: Cornell University.
- Sauerland, U. (2012). The computation of scalar implicatures: pragmatic, lexical or grammatical? *Language and Linguistics Compass*, 6(1), 36–49.
- Solt, S. (2015). Q-adjectives and the semantics of quantity. *Journal of Semantics*, 32(2), 221–273.
- von Stechow, A. (2009). The temporal degree adjectives früh(er)/spät(er) ‘early(er)’/‘late(r)’ and the semantics of the positive. In A. Giannakidou & M. Rathert (Eds.), *Quantification, definiteness, and nominalization* (pp. 214–233). Oxford: Oxford University Press.
- Zwarts, F. (1996). Facets of negation. In J. van der Does & J. van Eijck (Eds.), *Quantifiers, logic, and language* (pp. 385–421). Palo Alto, CA: Stanford University Press.

Sherry Yong Chen  
MIT Linguistics  
32 Vassar Street  
Cambridge MA 02139  
Email: *sychen@mit.edu*  
Website *<https://sherrychen.org>*