
SPECIAL COLLECTION: QUANTIFIER SCOPE: SYNTACTIC, SEMANTIC, AND EXPERIMENTAL APPROACHES

Universal quantifier PPIs

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Negative Polarity Items (NPIs) that denote lower scalar endpoints, such as existentials like *any* or *ever*, are often said to be only fine in Downward Entailing contexts, since outside such contexts their semantics would give rise to a contradiction. According to Chierchia (2006, 2013), this contradiction arises as such NPIs both obligatorily introduce domain alternatives and trigger the presence of a covert exhaustifier. Following this line of reasoning, I argue it should be expected that elements with the same properties that denote the highest endpoint of a scale, such as universal quantifiers, are Positive Polarity Items (PPIs). Indeed, universal quantifier PPIs have been attested in the domain of modals (quantifiers over possible worlds) – English *must* and *should* are good examples of such universal quantifier PPIs (cf. Iatridou & Zeijlstra 2010, 2013; Homer 2015) – but not in the domain of quantifiers over individuals. In this paper, I argue that PPIs that are universal quantifiers over individuals actually do exist. However, since the covert exhaustifier that is induced by these PPIs (and responsible for their PPI-hood) can act as an intervener between the PPI and its anti-licenser, universal quantifier PPIs may still scope below negation and thus appear in disguise; their PPI-like behaviour only becomes visible once they morpho-syntactically precede their anti-licenser. Universal quantifier PPIs may surface under negation, but may not reconstruct under negation once they appear above it. This article concludes that Dutch *iedereen* ('everybody'), unlike English *everybody*, is actually such a PPI.

Keywords: negation; universal quantifiers; positive polarity items; modal auxiliaries; exhaustification

1 Introduction

1.1 Theoretical background

According to a recent line of thinking (Krifka 1995; Lahiri 1998; Chierchia 2006, 2013, and others), Negative Polarity Items (NPIs) that are only fine in Downward Entailing (DE) contexts are ruled out outside DE contexts, since then their semantics would give rise to a contradiction.¹ That means that the sentences in (1), even though they are judged unacceptable, are strictly speaking not syntactically ill-formed, but rather violate their usage conditions (Kadmon & Landman 1993) or even yield a semantic anomaly (Krifka 1995; Lahiri 1998; Chierchia 2006, 2013).

- (1) a. *Mary has ever been there.
b. *I read any book.

¹ The observation that many NPIs are licensed in DE contexts goes back to Ladusaw (1979), who bases himself on Fauconnier (1975). Not all NPIs are licensed in DE contexts, however some NPIs, such as Chinese *shenme* or Greek *kanenas*, are also licensed outside DE contexts or have a distribution that cannot be captured in terms of DE or anti-additivity (cf. Zwarts 1998; Bernardi 2002; Giannakidou 2000; forthcoming; Lin et al. 2015; Lin 2017). Such NPIs should have a different source for their NPI-hood than NPIs that are licensed in DE contexts. In this paper I focus only on NPIs/PPIs that are (anti-)licensed in DE or anti-additive contexts.

Following Chierchia's (2006, 2013) implementation of this idea, NPIs are equipped with an uninterpretable feature $[u\sigma]$ that obligatorily introduces all its domain and scalar alternatives and that must be checked by a covert c-commanding exhaustifier that carries an interpretable feature $[\sigma]$ (or $[\sigma, D]$). Chierchia then argues that the combination of these two requirements triggers a semantic contradiction for every NPI outside a DE context. To illustrate this, let us focus on (1b). For Chierchia, the uninterpretable $[u\sigma]$ of *any book* needs to be checked ((2a) is ungrammatical). Once it gets checked by the covert exhaustifier (the only element able to check this feature), it yields a logical contradiction (2b).

- (2) a. [I read [any book]_[uσ]]
 b. [EXH_[σ] [I read [any book]_[uσ]]]

The question is of course why (2b) yields a contradiction. Following Chierchia, the uninterpretable feature $[u\sigma]$ introduces all scalar and domain alternatives. The scalar alternatives are all elements on the scale $\langle \textit{some/any}, \dots, \textit{all} \rangle$. The domain alternatives are all subdomains of the domain of quantification of the *any*-term. If in (2b) the domain of quantification is the set of books $\{a, b, c\}$, the domain alternatives are all subdomains of $\{a, b, c\}$, such as $\{a, c\}$, $\{b, c\}$, or $\{a\}$. The idea behind the introduction of domain alternatives has originally been guided by the intuition that NPIs are felt to be domain wideners. In terms of Kadmon & Landman (1993), domain wideners are elements that extend their domain of quantification beyond their contextual restrictions, including elements that are usually felt to be outside the domain of quantification. The claim that all NPIs are domain wideners has proven to be false (cf. Krifka 1995) and has therefore, in this approach, been replaced by the claim that all NPIs obligatorily introduce not only scalar but also domain alternatives.

The second factor behind the unacceptability of (2b) comes from the introduction of the exhaustifier. An exhaustifier that is applied to some proposition states that all stronger alternatives of that proposition are false. Chierchia (2013) introduces two exhaustification operators, **O** and **E**. **O** is the covert counterpart of *only*; **E** is the overt counterpart of *even*.² **E** is an exhaustifier that applies to emphatic minimizing NPIs only (such as *lift a finger*). Since *any* or *ever* do not count as emphatic NPIs, we focus here on **O** and adopt that EXH has the following semantics of **O**:

- (3) [[EXH]] = [[**O**]] = $\lambda p. p \wedge \forall q \in \text{Alt}(p)[p \not\subseteq q \rightarrow \neg q]$

Now, suppose again that the domain quantification is the set of books $\{a, b, c\}$. Then [[I read any book]] denotes $\exists x.[x \in \{a, b, c\} \ \& \ \text{read}(I, x)]$. Now, the domain alternatives of $\exists x.[x \in \{a, b, c\} \ \& \ \text{read}(I, x)]$ are:

- (4) a. $\exists x.[x \in \{a, b, c\} \ \& \ \text{read}(I, x)]$
 b. $\exists x.[x \in \{a, b\} \ \& \ \text{read}(I, x)]$
 c. $\exists x.[x \in \{a, c\} \ \& \ \text{read}(I, x)]$
 d. $\exists x.[x \in \{b, c\} \ \& \ \text{read}(I, x)]$
 e. $\exists x.[x \in \{a\} \ \& \ \text{read}(I, x)]$
 f. $\exists x.[x \in \{b\} \ \& \ \text{read}(I, x)]$
 g. $\exists x.[x \in \{c\} \ \& \ \text{read}(I, x)]$

² Note, though, that **O** and **E** do not have to be semantically identical to *only* and *even*, respectively. For instance, under Horn's (1969) presuppositional view *only p* presupposes *p* and asserts the exhaustification, whereas for Chierchia in **O** and **E** both components are part of the assertion.

Apart from (4a), all domain alternatives in (4) are stronger than $\exists x.[x \in \{a,b,c\} \ \& \ \text{read}(I, x)]$. That means that if EXH applies to $\exists x.[x \in \{a,b,c\} \ \& \ \text{read}(I, x)]$, all these stronger domain alternatives must be false.

- (5) $[[\text{EXH}(I \text{ read any books})]] =$
 $[\lambda p.p \wedge \forall q \in \text{Alt}(p)[p \not\subseteq q \rightarrow \neg q]](\exists x.[x \in \{a,b,c\} \ \& \ \text{read}(I, x)]) =$
 $\exists x.[x \in \{a,b,c\} \ \& \ \text{read}(I, x)] \ \&$
 $\neg \exists x.[x \in \{a,b\} \ \& \ \text{read}(I, x)] \ \&$
 $\neg \exists x.[x \in \{a,c\} \ \& \ \text{read}(I, x)] \ \&$
 $\neg \exists x.[x \in \{b,c\} \ \& \ \text{read}(I, x)] \ \&$
 $\neg \exists x.[x \in \{a\} \ \& \ \text{read}(I, x)] \ \&$
 $\neg \exists x.[x \in \{b\} \ \& \ \text{read}(I, x)] \ \&$
 $\neg \exists x.[x \in \{c\} \ \& \ \text{read}(I, x)]$

But the conjunction of all negated stronger domain alternatives entails that there is no element, member of the set $\{a,b,c\}$, that has been read by me. This already follows from the three negated domain alternatives where the domain of quantification is a singleton set: $\neg \exists x.[x \in \{a\} \ \& \ \text{read}(I, x)] \ \& \ \neg \exists x.[x \in \{b\} \ \& \ \text{read}(I, x)] \ \& \ \neg \exists x.[x \in \{c\} \ \& \ \text{read}(I, x)] \Leftrightarrow \neg \exists x.[x \in \{a,b,c\} \ \& \ \text{read}(I, x)]$. But then $[[\text{EXH}(I \text{ read any books})]]$ must have the denotation in (6), which forms a logical contradiction.

- (6) $\exists x.[x \in \{a,b,c\} \ \& \ \text{read}(I, x)] \ \& \ \neg \exists x.[x \in \{a,b,c\} \ \& \ \text{read}(I, x)]$

For Chierchia, following Gajewski (2002), sentences that are logically contradictory are judged as unacceptable.³ If logically contradictory statements indeed trigger unacceptability judgments, the unacceptability of (2b) directly follows.

However, if the NPI is embedded in a DE context, things change. To see this, take (7).

- (7) I didn't read any book.

Again, exhaustification of (7) will result in all stronger domain alternatives of (7) being false. But now, no domain alternative of (7), listed in (8), is actually stronger than (7). Apart from (8a), all of them are weaker, due to the fact that the negation reverses the direction of the inference.

- (8) a. $\neg \exists x.[x \in \{a,b,c\} \ \& \ \text{read}(I, x)]$
 b. $\neg \exists x.[x \in \{a,b\} \ \& \ \text{read}(I, x)]$
 c. $\neg \exists x.[x \in \{a,c\} \ \& \ \text{read}(I, x)]$
 d. $\neg \exists x.[x \in \{b,c\} \ \& \ \text{read}(I, x)]$
 e. $\neg \exists x.[x \in \{a\} \ \& \ \text{read}(I, x)]$
 f. $\neg \exists x.[x \in \{b\} \ \& \ \text{read}(I, x)]$
 g. $\neg \exists x.[x \in \{c\} \ \& \ \text{read}(I, x)]$

³ Note that for Chierchia, following Gajewski (2002), only logically contradictory expressions are ungrammatical; not just any contradictory expression. An expression is logically contradictory if and only if under all significant rewritings of its non-logical parts, the contradiction remains, as is the case for unlicensed NPIs of the relevant kind. This is not the case for non-logical contradictions, such as *It rains and it doesn't rain*, since one could rephrase the second *rains* with *snow* and the contradiction disappears.

Consequently, exhaustification in (7) applies vacuously: $[[\text{EXH}(\text{I didn't read any book})]] = [[\text{I didn't read any book}]]$ and the sentence just has the reading $\neg\exists x.[x \in \{a,b,c\}] \& \text{read}(I, x)$ and is not unacceptable.⁴

1.2 Question: Universal PPIs

According to Chierchia's proposal, the combinatorial properties of $[\text{u}\sigma]$, the introduction of domain alternatives, and the exhaustification requirement ensure that any existential quantifier or other element denoting low-scale endpoints that is equipped with such a feature $[\text{u}\sigma]$ is an NPI. At the same time, even though this has not been explicitly claimed within the framework, Chierchia's proposal also predicts that any universal quantifier that carries such a feature should be a Positive Polarity Item (PPI). To see this, take the non-existing word *pevery* to contain such a feature. Then the underlying syntax of (9a), with this feature $[\text{u}\sigma]$ being checked by EXH, would be (9b).

- (9) a. I read *pevery* book.
 b. $[\text{EXH}_{[\sigma]} [\text{I read } [\text{pevery book}]_{[\text{u}\sigma]}]]$

Now, the exhaustifier in (9b) applies vacuously. The reason is that none of the domain alternatives of *I read pevery book* are stronger than *I read pevery book* itself: of all the propositions in (10), (10a) is the strongest.

- (10) a. $\forall x.[x \in \{a,b,c\} \rightarrow \text{read}(I, x)]$
 b. $\forall x.[x \in \{a,b\} \rightarrow \text{read}(I, x)]$
 c. $\forall x.[x \in \{a,c\} \rightarrow \text{read}(I, x)]$
 d. $\forall x.[x \in \{b,c\} \rightarrow \text{read}(I, x)]$
 e. $\forall x.[x \in \{a\} \rightarrow \text{read}(I, x)]$
 f. $\forall x.[x \in \{b\} \rightarrow \text{read}(I, x)]$
 g. $\forall x.[x \in \{c\} \rightarrow \text{read}(I, x)]$

However, things are different with the negated counterpart of (9):

- (11) a. I didn't read *pevery* book.
 b. $[\text{EXH}_{[\sigma]} [\text{I didn't read } [\text{pevery book}]_{[\text{u}\sigma]}]]$

The semantics of (11b) yields a logical contradiction, for the very same reason as (2b) does. The reason is that all domain alternatives of $\neg\forall x.[x \in \{a,b,c\} \rightarrow \text{read}(I, x)]$, listed in (12), entail $\neg\forall x.[x \in \{a,b,c\} \rightarrow \text{read}(I, x)]$.

- (12) a. $\neg\forall x.[x \in \{a,b,c\} \rightarrow \text{read}(I, x)]$
 b. $\neg\forall x.[x \in \{a,b\} \rightarrow \text{read}(I, x)]$
 c. $\neg\forall x.[x \in \{a,c\} \rightarrow \text{read}(I, x)]$
 d. $\neg\forall x.[x \in \{b,c\} \rightarrow \text{read}(I, x)]$

⁴ Chierchia's approach is not uncontroversial or uncontested, and has been criticised by Geurts (2009), Giannakidou (2011; forthcoming), Giannakidou & Quer (2013), and Collins & Postal (2014), among others. Criticisms concern, for instance, the empirical evidence for the introduction of domain alternatives, the fact that it is unclear whether (weak) NPIs are indeed licensed by DE contexts only, and the idea that logical contradictions yield unacceptability effects. In particular, the question arises to what extent questions that license NPIs are DE (see Mayr 2013; Nicolae 2015 for specific proposals on the ability of questions to license NPIs under this approach). For an overview of the criticisms, see Giannakidou (2011; forthcoming), and references therein.

- e. $\neg \forall x.[x \in \{a\} \rightarrow \text{read}(I, x)]$
 f. $\neg \forall x.[x \in \{b\} \rightarrow \text{read}(I, x)]$
 g. $\neg \forall x.[x \in \{c\} \rightarrow \text{read}(I, x)]$

Then the meaning of (11b) then is again contradictory, and should render the sentence unacceptable:

$$\begin{aligned}
 (13) \quad & [[\text{EXH}(\text{I didn't read pevery book})]] = \\
 & [\lambda p.p \wedge \forall q \in \text{Alt}(p)[p \not\subseteq q \rightarrow \neg q]](\neg \forall x.[x \in \{a,b,c\} \rightarrow \text{read}(I, x)]) = \\
 & \neg \forall x.[x \in \{a,b,c\} \rightarrow \text{read}(I, x)] \ \& \\
 & \quad \neg \neg \forall x.[x \in \{a,b\} \rightarrow \text{read}(I, x)] \ \& \\
 & \quad \neg \neg \forall x.[x \in \{a,c\} \rightarrow \text{read}(I, x)] \ \& \\
 & \quad \neg \neg \forall x.[x \in \{b,c\} \rightarrow \text{read}(I, x)] \ \& \\
 & \quad \neg \neg \forall x.[x \in \{a\} \rightarrow \text{read}(I, x)] \ \& \\
 & \quad \neg \neg \forall x.[x \in \{b\} \rightarrow \text{read}(I, x)] \ \& \\
 & \quad \neg \neg \forall x.[x \in \{c\} \rightarrow \text{read}(I, x)] = \\
 & \neg \forall x.[x \in \{a,b,c\} \rightarrow \text{read}(I, x)] \ \& \\
 & \quad \forall x.[x \in \{a,b\} \rightarrow \text{read}(I, x)] \ \& \\
 & \quad \forall x.[x \in \{a,c\} \rightarrow \text{read}(I, x)] \ \& \\
 & \quad \forall x.[x \in \{b,c\} \rightarrow \text{read}(I, x)] \ \& \\
 & \quad \forall x.[x \in \{a\} \rightarrow \text{read}(I, x)] \ \& \\
 & \quad \forall x.[x \in \{b\} \rightarrow \text{read}(I, x)] \ \& \\
 & \quad \forall x.[x \in \{c\} \rightarrow \text{read}(I, x)]
 \end{aligned}$$

The universal counterpart of NPI *any*, according to Chierchia's theory, is predicted to be a PPI. But languages do not seem to employ universal quantifiers, such as *all*, *everybody* or *everything*, that are PPIs. Such quantifiers can all take scope below negation, even when they appear above negation in their surface position. Within the domain of quantifiers over individuals, most PPIs have been taken to be existential quantifiers (e.g. English *some*), not universal quantifiers. This gives rise to the question as to why universal quantifiers like *all*, *everybody* or *everything* that show PPI-behaviour have not been attested thus far.

Some answers may suggest themselves. For instance, it may be the case that, for some reason, polarity effects may appear only among existential quantifiers. In this way, the *pevery*-problem, the fact that no language seems to exhibit a PPI with a logically accessible meaning like *pevery*, would be similar to the absence of the so-called *nall*-quantifier: no language in the world has a single lexical item meaning 'not all' (cf. Horn 1989, 2012; Jaspers 2005 for discussion and an overview of the literature).⁵ But this cannot be correct.

First, the existing analyses for the explanation of the *nall*-problem all focus on the fact that universal quantifiers cannot be negatively marked. But the universal counterpart is a PPI, which is at best being positively marked. Second, it turns out that, in another domain of quantification, namely quantification over possible worlds, universal quantifier PPIs are indeed attested. For example, English *must* is a PPI (cf. Iatridou & Zeijlstra 2013; Homer 2015). That shows that it is not inherently impossible for a universal quantifier to be a PPI. Hence, the apparent absence of universal quantifiers over individuals that are PPIs needs an independent explanation.

⁵ An alternative approach would be to say that PPIs are not the mirror image of NPIs (as claimed by, e.g., Ernst 2009; Giannakidou 2011). However, that would not solve this problem, as Chierchia's approach predicts that there are universal quantifier PPIs that are the mirror image of NPIs, irrespective of the question whether other (non-universal) PPIs behave as mirror NPIs or not.

1.3 Outline

In Section 2, I first demonstrate that at least certain universal modals that are PPIs are PPIs for the very same reason that under Chierchia's approach NPIs are NPIs. In Section 3, I show that the exact implementation of this approach predicts that such universal quantifier PPIs may actually surface under negation, as the exhaustifier whose presence they trigger may scopally intervene between the negation (or any other anti-licenser) and the PPI itself. I argue that, consequently, universal quantifier PPIs are fine under negation as long as they appear under negation at surface structure, but may not reconstruct under negation when they appear above negation at surface structure. In Section 4, I present several cases of such universal quantifier PPIs, showing that universal quantifiers, albeit in disguise, can indeed be attested, both in the domain of quantifiers over possible worlds and in the domain of quantifiers over individuals. Section 5 focuses on different kinds of PPIs (in particular strong vs. weak PPIs) and shows how their differences follow from a small and independently motivated amendment of Chierchia's proposal for NPI-hood. Section 6 concludes.

2 Modal PPIs

As has been pointed out by Israel (1996), Iatridou & Zeijlstra (2010, 2013) and Homer (2015), universal modals that take wide scope with respect to sentential negation, like English *must*, *should* or *ought to*, should be analysed as PPIs.

- (14) a. She must not leave. $\square > \neg$
 b. She should not leave. $\square > \neg$
 c. She ought not to leave. $\square > \neg$

Iatridou & Zeijlstra (2010, 2013) and Homer (2015) analyse these modals as PPIs, as only these modal auxiliaries outscope negation. Other modals auxiliaries, existential modals and other universal modals alike, in principle take scope under negation:

- (15) a. She doesn't have to leave. $\neg > \square$
 b. She doesn't need to leave. $\neg > \square$
- (16) a. She cannot leave. $\neg > \diamond$
 b. She may not leave. $\neg > \diamond$

In fact, in the domain of deontic modals, all existential modals scope under sentential negation.⁶ Iatridou & Zeijlstra (2010, 2013) argue that modals auxiliaries are base-generated in a position below negation, where they should also be interpreted, regardless of whether they raise to a higher position at the surface structure or not. This then explains that the modals in (15) and (16) take scope below negation. Only if an interpretation under the scope of negation would lead to ungrammaticality, Iatridou & Zeijlstra argue, may the modal be interpreted in its surface position or even raise to a higher position

⁶ The domain of epistemic modals is richer in terms of polarity effects than that of deontic modals, in the sense that various existential modals also exhibit NPI- or PPI-effects when used epistemically, but not when used deontically. For instance, epistemic *can* is an NPI (*She can't/*can have been the murderer*) and epistemic *may* is a PPI (*She may not be the murderer* has only a reading $\text{may} > \text{not}$); however, in their deontic usages *can* and *may* are polarity-neutral. As in this paper I focus only on universal quantifier PPIs, such existential, epistemic PPIs have been left outside the discussion and should require a different type of analysis. I am not aware of universal modal auxiliaries that are PPI-like in only epistemic or only deontic usages; hence, while focusing on deontic modals, the conclusions reached in this paper for deontic universal modal auxiliary PPIs naturally extend to epistemic universal modal auxiliary PPIs, but they do not extend to existential PPIs.

If modals like *must*, *should* and *ought to* are PPIs, the question naturally pops up as to why they are PPIs in the first place. One answer, in the light of the discussion, suggests itself: they are universal quantifiers that have the same properties that Chierchia (2006, 2013) attributes to existential quantifiers that are NPIs. If *must*, *should* and *ought to* are introducers of domain alternatives that require the presence of a covert exhaustifier, it follows immediately that they may not take scope under negation: that would give rise to a semantic contradiction again.

To see this, take (20), where the modal does not reconstruct below negation. Let's assume that the modal base of (20a) consists of the worlds w_1, w_2, w_3 . The semantics of *She must leave* (without the exhaustifier) is then as in (21a). Since no domain alternative is stronger than (21a), exhaustification applies vacuously and the meaning of (20b) is as in (21a).

- (20) a. She must not leave.
 b. $[\text{EXH}_{[0]} [\text{she must}_{[\text{t}\sigma]} \text{not leave}]]$
- (21) a. $\forall w. [w \in \{w_1, w_2, w_3\} \rightarrow \neg \text{leave}_w(\text{she})]$
 b. $\forall w. [w \in \{w_1, w_2\} \rightarrow \neg \text{leave}_w(\text{she})]$
 c. $\forall w. [w \in \{w_1, w_3\} \rightarrow \neg \text{leave}_w(\text{she})]$
 d. $\forall w. [w \in \{w_2, w_3\} \rightarrow \neg \text{leave}_w(\text{she})]$
 e. $\forall w. [w \in \{w_1\} \rightarrow \neg \text{leave}_w(\text{she})]$
 f. $\forall w. [w \in \{w_2\} \rightarrow \neg \text{leave}_w(\text{she})]$
 g. $\forall w. [w \in \{w_3\} \rightarrow \neg \text{leave}_w(\text{she})]$

Now suppose that *must* would reconstruct under negation. The logical form of (22a) would then be as in (22b). But now all relevant domain alternatives are stronger than the proposition $[\text{she } e \text{-n't must}_{[\text{t}\sigma]} \text{-leave}]$ and therefore (22b) has the semantics in (23). But (23) is a contradiction, as it states that not in all worlds w_1, w_2, w_3 she leaves, and at the same time that she leaves in all worlds w_1, w_2, w_3 . This proposal thus correctly predicts that *must* cannot reconstruct below negation.

- (22) a. She mustn't leave.
 b. $[\text{EXH}_{[0]} [\text{she } e \text{-n't must}_{[\text{t}\sigma]} \text{-leave}]]$
- (23) $\neg \forall w. [w \in \{w_1, w_2, w_3\} \rightarrow \text{leave}_w(\text{she})] \ \&$
 $\neg \neg \forall w. [w \in \{w_1, w_2\} \rightarrow \text{leave}_w(\text{she})] \ \&$
 $\neg \neg \forall w. [w \in \{w_1, w_3\} \rightarrow \text{leave}_w(\text{she})] \ \&$
 $\neg \neg \forall w. [w \in \{w_2, w_3\} \rightarrow \text{leave}_w(\text{she})] \ \&$
 $\neg \neg \forall w. [w \in \{w_1\} \rightarrow \text{leave}_w(\text{she})] \ \&$
 $\neg \neg \forall w. [w \in \{w_2\} \rightarrow \text{leave}_w(\text{she})] \ \&$
 $\neg \neg \forall w. [w \in \{w_3\} \rightarrow \text{leave}_w(\text{she})] =$
 $\neg \forall w. [w \in \{w_1, w_2, w_3\} \rightarrow \text{leave}_w(\text{she})] \ \&$
 $\forall w. [w \in \{w_1, w_2\} \rightarrow \text{leave}_w(\text{she})] \ \&$
 $\forall w. [w \in \{w_1, w_3\} \rightarrow \text{leave}_w(\text{she})] \ \&$
 $\forall w. [w \in \{w_2, w_3\} \rightarrow \text{leave}_w(\text{she})] \ \&$
 $\forall w. [w \in \{w_1\} \rightarrow \text{leave}_w(\text{she})] \ \&$
 $\forall w. [w \in \{w_2\} \rightarrow \text{leave}_w(\text{she})] \ \&$
 $\forall w. [w \in \{w_3\} \rightarrow \text{leave}_w(\text{she})]$

One caveat should be made, though. The toy model used in (21)–(23), contains only three possible worlds. In more realistic models, the number of worlds is of course much bigger (and can even be infinite). More importantly, the alternatives will not reduce down to singleton sets, as there is never enough information for a speaker/hearer to narrow down the domain of worlds into singleton sets. Note, though, that for this approach to yield the contradiction it is only necessary that the domain alternatives are partitioned and that the union of all domain alternatives is already the same set as the original domain of quantification. For instance, in (23) the contradiction would also be yielded without any singleton alternatives. In fact, if there is already a partition with two subdomains, with, for some proposition *p*, one subdomain consisting of all and only all *p*-worlds and the other subdomain consisting of all and only all not-*p*-worlds, the contradiction is yielded. Both subdomain alternatives would then be stronger, whereas the union of these subdomains of quantification is still identical to the original domain of quantification.

The fact that modal PPIs can be analysed along the lines sketched above does, however, not entail that they have to be analysed as such. It could very well be the case that the source of their PPI-hood lies elsewhere. However, there are good reasons to analyse them along the suggested lines.

First, Chierchia's approach builds upon the idea, originally proposed by Kadmon & Landman (1993), that existential NPIs (and thus universal PPIs in their slipstream) are elements that must be strengthened. Kadmon & Landman argue that existential NPIs are domain wideners that stretch their domain of quantification beyond its contextual restrictions. They argue, for instance, that (24b) is stronger than (24a):

- (24) a. I don't have potatoes.
b. I don't have any potatoes.

And even though the judgements are subtle, it seems that similar effects are attestable in the case of *must* and *have to*. Although both sentences in (25) seem slightly degraded, native speakers prefer (25b) over (25a), suggesting that (26a) is stronger than (26b).

- (25) a. She must leave; in fact, she has to leave.
b. She has to leave; in fact, she must leave.

- (26) a. She must leave.
b. She has to leave.

However, the idea that all NPIs are domain wideners has been criticised (see, e.g., Krifka 1995, among others). For this reason, Chierchia replaced it by the introduction of domain alternatives, where a licensed NPI (and thus also a non-anti-licensed PPI) should not necessarily exhibit strengthening effects, as strengthening by the covert exhaustifier may take place vacuously. Hence, even though the data in (25) do not run against the suggested analysis, they cannot be taken to be conclusive.

Second, an alternative way to evaluate the suggested analysis is by comparing it to other competing analyses. One potential alternative that comes to mind, though, is that certain modals like *must* or *should* are in some sense performative and would therefore require a higher LF position than negation. However, such an analysis, especially for *must*, runs at odds with the fact that in various cases the modal PPI may indeed take scope below negation and is thus allowed in an LF-position below the position of negation (see (18)–(19)). Another alternative would be Giannakidou & Mari's (2016) approach to PPI-hood of epistemic modal adverbs, which takes a positive speaker's perspective to be

the source of the PPI-hood of speaker-oriented modal adverbs such as *unfortunately* or *probably*. Giannakidou & Mari's approach particularly focuses on modal adverbs, but less so on modal auxiliaries. More importantly, their approach only applies to non-universal epistemic modal PPIs, whereas the reported modal PPIs here are all deontic modals (cf. Iatridou & Zeijlstra 2013; Homer 2015).⁸

Third, the strongest piece of evidence, however, comes from the hitherto unreported observation that PPIs under this approach should be able to “self-intervene” (though see Iatridou & Zeijlstra 2013: 557, footnote 40). The argument is quite complex, but takes at heart the possibility that the exhaustifier that the PPI induces may appear in a scopal position between the PPI and its anti-licenser and therefore allows the PPI to take (indirect) scope under it. In the following section this argument will be spelled out in detail.

3 Universal PPIs as self-interveners

Under Chierchia's approach, every NPI that is exhaustified gives rise to a logical contradiction unless some DE operator intervenes between the exhaustifier and the NPI:

(27) EXH > DE > NPI

All other scopal configurations of EXH, DE and NPI than (27) give rise to either a feature-checking violation (when the uninterpretable feature [uσ] remains unchecked) or give rise to a logical contradiction. However, in the domain of PPIs, things are different. Whereas (28) is a scopal configuration that yields ungrammaticality, other scopal configurations between EXH, a DE operator and a PPI are fine:

(28) *EXH > DE > PPI

One such configuration that is fine is the one where the DE operator appears under the scope of the PPI (as in (29)), which we saw was the scopal configuration that emerges when the modal does not reconstruct (in the case of *She must not leave*).

(29) EXH > PPI > DE

But another licit scopal configuration that has not been discussed so far is the one in (30).

(30) DE > EXH > PPI

Nothing in (30) violates any rule of grammar. The PPI's uninterpretable feature [uσ] has been checked by higher EXH; application of EXH over its (propositional) complement does not give rise to any contradiction (as no DE operator is embedded in the complement of EXH); and, finally, since exhaustification applies vacuously, nothing forbids the DE operator to take scope over its own complement that contains the vacuously exhaustified PPI. Since no further EXH is included, (30) can underlie acceptable sentences.

To see this, take (31a) again, repeated from (11), but now with the logical form in (30)/(31b):

- (31) a. I didn't read pevery book.
 b. [not [EXH_[σ] [I read [pevery book]_[uσ]]]]

⁸ Even though Giannakidou & Mari (2016) is a substantially different approach to polarity-sensitivity than Chierchia (2013), they both reduce the unacceptability of utterances containing unlicensed polarity items to inherent contradictions. For Chierchia, an unlicensed NPI yields a contradictory assertion; for Giannakidou & Mari the assertion of a clause containing an unlicensed (epistemic) PPI contradicts its presupposition.

Now, the exhaustifier in (31b) applies vacuously. The reason is that *I read pevery book* is first exhaustified, before negation applies. But then exhaustification applies vacuously: of all the propositions in (32), (32a) is the strongest.

- (32) a. $\forall x.[x \in \{a,b,c\} \rightarrow \text{read}(I, x)]$
 b. $\forall x.[x \in \{a,b\} \rightarrow \text{read}(I, x)]$
 c. $\forall x.[x \in \{a,c\} \rightarrow \text{read}(I, x)]$
 d. $\forall x.[x \in \{b,c\} \rightarrow \text{read}(I, x)]$
 e. $\forall x.[x \in \{a\} \rightarrow \text{read}(I, x)]$
 f. $\forall x.[x \in \{b\} \rightarrow \text{read}(I, x)]$
 g. $\forall x.[x \in \{c\} \rightarrow \text{read}(I, x)]$

Hence, the meaning of [EXH [I read [pevery book]]] is the same as the meaning of [I read [pevery book]] (both mean $\forall x.[x \in \{a,b,c\} \rightarrow \text{read}(I, x)]$), which can subsequently be negated without any problem (yielding $\neg \forall x.[x \in \{a,b,c\} \rightarrow \text{read}(I, x)]$). Hence, a universal quantifier PPI can actually take scope below negation, provided the logical form is one where negation does not take scope in between the (higher) EXH and the (lower) PPI.

The only difference between unacceptable (28) and acceptable (30) concerns the position of the covert exhaustifier. The question thus arises as to what determines the position of a covert operator in a sentence. In this we follow Zeijlstra (2008a; b, 2012) who for the inclusion of abstract negative operators argues that the locus of the abstract operator must be in a position c-commanding the highest overt marker of it at surface structure. For Zeijlstra, neg-words in negative concord languages (where multiple negatively marked elements give rise to one semantic negation only) carry an uninterpretable feature [uNEG] that, much alike NPIs/PPIs under the approach pursued here, must be c-commanded by a (possibly) covert operator that carries the matching interpretable feature [iNEG]. Under the postulation that the covert negative operator is in a position higher than any of the neg-words (or other elements carrying an uninterpretable feature [uNEG]), it follows that all neg-words take scope below negation, a desirable result under the relatively well-established assumption that neg-words are existentials or indefinites. An illustrating example for Italian is given below:

- (33) a. *Italian*
 Nessuno ha telefonato a nessuno.
 neg-body has called to neg-body
 ‘Nobody called anybody.’
 b. $[\text{OP}_{[iNEG]} [\text{nessuno}_{[uNEG]} [\text{ha telefonato} [\text{a nessuno}_{[uNEG]}]]]]$

One might wonder what the nature of the principle is that states that covert operators must be assumed to be present in a position c-commanding the highest overt marker of them. There are two ways to think about that. First, the mechanism can be derived from Chomsky’s Merge-over-Move constraint. Inserting an abstract operator below an element that marks this operator (i.e. that stands in an Agree relation with it), requires an additional step of movement. To see this, take (33) again. If Op_{\neg} were inserted below highest *nessuno*, *nessuno* should have been base-generated in a position even lower than Op_{\neg} to have its feature checked under c-command, or Op_{\neg} should have been raised to a higher position:⁹

⁹ Agreement with respect to negative features always requires the interpretable feature to c-command the uninterpretable one(s) (cf. Brown 1999; Weiss 2002; Zeijlstra 2004). In Zeijlstra (2012) it is argued that all instances of agreement work in this way, contra Chomsky (1995, 2001). See Preminger (2013) for a critique on this proposal.

- (34) a. [nessuno_{[uNEG]i} [OP_[iNEG] t_i ha telefonato [a nessuno_[uNEG]]]]
 b. [OP_[iNEG] [nessuno_[uNEG] t_i ha telefonato [a nessuno_[uNEG]]]]

Since a competing derivation, (33b), lacks these extra movement steps, (34a–b) can be ruled out under Merge-over-Move.

Alternatively, one can also conceive the principle that posits the abstract operator in a position above the highest overt agreeing marker as an extra-grammatical constraint on grammatical structures. Under such a conception, all derivations that contain an abstract operator in some position where it can check off the relevant uninterpretable features and that do not give rise to semantic anomalies are grammatically fine, but are not parsable. It is the parser that includes the abstract operator the moment that the parser detects its marker; so the only sentences that are both parsable and grammatically correct are the ones where the operator is higher than its highest agreeing marker. Such extra-grammatical constraints are not unfamiliar in grammatical theory. For instance, Ackema & Neeleman (2002), Abels & Neeleman (2012), and Biberauer et al. (2014) allude to similar mechanisms, albeit in different ways, to account for various left-right asymmetries in grammar, such as the ban on rightward movement.

As for now, I remain agnostic about how exactly EXH-inclusion is constrained, but, in full analogy to the inclusion of abstract negative operators, I take the following to hold:

- (35) In any sentence with an NPI/PPI that needs to be checked by a covert exhaustifier, this exhaustifier must be present in a position where it c-commands the NPI/PPI at surface structure.

We are now in a position to determine which scopal configurations are fine for exhausted PPIs and which ones are not. The question at stake is when a scope configuration like (30), repeated in (36) below, is licit. After all, when (30)/(36) would reflect a possible LF, it shows that PPIs may indeed appear under the scope of their anti-licenser, provided that the exhaustifier they induce acts as an intervener. The answer to this question is now straightforward: if a PPI is in a position lower than its anti-licenser, EXH may c-command the PPI under the DE operator, provided that the complement of EXH is propositional. Then, the PPI can take scope under its anti-licenser:

- (36) DE > EXH > PPI

If, however, the PPI c-commands its anti-licenser at surface structure, the exhaustifier must be in a position c-commanding both the PPI and the DE anti-licenser:

- (37) EXH > PPI > DE

Note that both (36) and (37) are acceptable scope construals. However, a consequence of this is that any sentence where the exhaustifier that checks off the uninterpretable feature [u σ] of a PPI that c-commands a DE operator at surface structure would forbid the PPI to reconstruct below the DE operator, even in cases where non-PPIs would be allowed to reconstruct. The reason is that, then, this PPI would end up in the illicit scope configuration (38) that yields a logical contradiction.

- (38) *EXH > DE > PPI

So, a particular prediction that I take the application of Chierchia's (2006, 2013) mechanism to make is that PPIs, at least those PPIs that are PPIs due to the presence

of [uo], are elements that (i) may appear and take scope under DE operators at surface structure; and (ii) when they appear above a DE operator at surface structure, may not reconstruct below it.

Now strikingly, all modal PPIs in English appear above the negative marker:

- (39) a. She mustn't leave.
 b. She oughtn't leave.
 c. She shouldn't leave.
 d. She isn't to leave.

Also, several other languages discussed in Iatridou & Zeijlstra (2013) place PPI modals in a position above the negation, such as (Northern/Western) Dutch *moeten* ('must') or German *sollen* ('should'):

- (40) *Dutch*
 Zij moet niet vertrekken.
 she must not leave □ > ¬
 'She mustn't leave.'

- (41) *German*
 Sie soll nicht gehen.
 she should not go □ > ¬
 'She shouldn't go.'

The other languages involving modal PPIs discussed in Iatridou & Zeijlstra (2013) do not place the modals in a position below negation, but rather have them form one morpho-phonological unit, suggesting that these complex expressions occupy the same position in the syntactic structure. Examples here come from Greek and Spanish.

- (42) *Greek*
 Dhen-prepi na to kanume afto.
 not-must PRT it do this □ > ¬
 'We must not do this.'

- (43) *Spanish*
 Juan no-debe ir.
 John not-must leave □ > ¬
 'John must not leave.'

Both Greek *dhen* and Spanish *no* are clitic-like elements (hosted in Neg^o) that head-adjoin from a lower position into the modal head (cf. Zanuttini 1997, 2001; Giannakidou 1998; Zeijlstra 2004; Merchant 2006 for a cross-linguistic survey of the morpho-syntactic status of such negative markers). Arguably, no abstract operator can intervene in such complex words and the PPI may only appear at LF in between the negation and the DE operator.

Hence, all modal PPIs attested so far appear either above negation or form a morpho-phonological complex with it. This is already strongly in line with the proposed analysis. But even more evidence can be provided. Dutch is a language that exhibits V-to-C movement in main clauses, but not in embedded clauses. Modal auxiliaries, being verbal in nature, thus appear above negation in main clauses, but below negation in subordinate clauses. Consequently, Dutch *moeten* ('must') in negative main clauses can only yield the scopal configuration EXH > MUST > DE and behaves PPI-like:

- (44) *Dutch*
 Zij moet niet vertrekken. EXH > MUST > DE
 she must not leave
 ‘She mustn’t leave.’

However, in embedded clauses, two scopal orderings should be fine: one where EXH intervenes between the negation and the modal, and one where EXH takes widest scope:

- (45) *Dutch*
 ... dat zij niet moet vertrekken EXH > MUST > DE
 ... that she must not leave DE > EXH > MUST
 ‘... she mustn’t leave’ / ‘... she doesn’t have to leave’

Example (45) is thus predicted to be ambiguous, unlike (44), a prediction that is indeed born out:

- (46) *Dutch*
 a. *Zij moet niet vertrekken, maar het mag wel.
 she must not leave, but it may PRT
 ‘She mustn’t leave, but it is allowed.’
 b. Zij moet niet vertrekken, omdat het verboden is.
 she must not leave, because it forbidden is
 ‘She mustn’t leave, because it is forbidden.’

- (47) *Dutch*
 a. Ik weet dat zij niet moet vertrekken, maar dat het wel mag.
 I know that she not must leave, but that it PRT may
 ‘I know that she doesn’t have to leave, but that it is allowed.’
 b. Ik weet dat zij niet moet vertrekken, omdat het verboden is.
 I know that she not must leave, because it forbidden is
 ‘I know that she mustn’t leave, because it is forbidden.’

The fact that the Dutch pattern shows exactly the predicted behaviour can be taken as a piece of evidence in favour of the proposal that takes PPI modals to be universal quantifiers that introduce domain alternatives and that require covert exhaustification. But it gives rise to a new question as well: why have universal quantifier PPIs only been attested in the domain of modal auxiliaries and never in the domain of quantifiers over individuals?

4 PPIs in the domain of universal quantifiers over individuals

Nothing in this proposal on the PPI status of modals hinges on the fact that they are quantifiers over possible worlds. In fact, the approach to NPI-hood has even been developed for quantifiers over individuals. Hence, nothing in the approach should forbid the existence of universal quantifiers over individuals that are PPIs (for the same reason). However, no such PPI has been attested so far.

In this section, I argue that the reason why only universal PPIs have been attested among quantifiers over possible worlds and not among quantifiers over individuals, again, lies in the fact that universal quantifier PPIs may actually scope under negation, and therefore do not appear to be PPIs. To see this, take again the scopal ordering of a universal quantifier with a feature [u σ], negation and the covert exhaustifier that gives rise to the logical contradiction, the ordering in (48):

(48) *EXH > NEG > \forall

If negation intervenes between the exhaustifier and the universal, a contradiction arises. But, as argued above, nothing requires that a universal quantifier with a feature $[\text{u}\sigma]$ (henceforward $\forall_{[\text{u}\sigma]}$) has its exhaustifier scope higher than the negation: the feature $[\text{u}\sigma]$ only requires that the exhaustifier c-commands the $\forall_{[\text{u}\sigma]}$ and therefore has scope over it, but does not require that it has immediate scope. An alternative underlying syntactic configuration for such a universal quantifier carrying a feature $[\text{u}\sigma]$ is (49):

(49) NEG > EXH > \forall

But (49) does not give rise to a logical contradiction. As shown in (31)–(32), the proposition *I read every_[\text{u}\sigma] book*, denoting $\forall x.[x \in \{a,b,c\} \rightarrow \text{read}(I, x)]$, could be exhaustified (a vacuous operation, since it is already stronger than any of its alternatives) before it gets negated. The denotation of (49) is then just (50), where the exhaustifier intervenes.

(50) $\neg \forall x.[x \in \{a,b,c\} \rightarrow \text{read}(I, x)]$

Universal PPIs (or to be more precise: universal quantifiers that obligatorily introduce domain alternatives that must be exhaustified) are fine in negative/DE contexts as long as the exhaustifier takes scope in between the anti-licenser and the universal quantifier itself. Universal quantifier PPIs may appear under negation without being unacceptable and therefore are unrecognizable as such.

How do we know, then, if such PPIs that are universal quantifier over individuals exist in the first place? As discussed before, we can only do so on the basis of examples where a universal quantifier negation appears above a morphologically independent negative marker at surface structure. In that case the surface scope order would be EXH > \forall > NEG. Under such a configuration, the universal quantifier that is equipped with a feature $[\text{u}\sigma]$ cannot reconstruct below negation (as this would give rise to a logical contradiction), but a universal quantifier that is lacking $[\text{u}\sigma]$ would be able to reconstruct below negation.

Interestingly, variation between universal quantifiers that may and that may not reconstruct under negation when appearing above it at surface structure has indeed been attested (and never been properly explained). In the remainder of this section, I argue that the only distinction between such quantifiers is the presence or the absence of a feature $[\text{u}\sigma]$ on \forall . Following this line of reasoning, it can actually be established that English *everybody* is not a PPI, but that Dutch *iedereen* ('everybody') is a PPI, to the best of my knowledge a novel observation.

In English and most other languages (cf. Zeijlstra 2004 for an overview), for almost all speakers a universal quantifier that precedes negation may reconstruct under negation. Sentence (51) is ambiguous between a wide-scope reading of the universal quantifier with respect to the negation ('nobody left') and a narrow-scope reading ('not everybody left'), the latter being the most salient reading. This shows that English *everybody* cannot carry a feature $[\text{u}\sigma]$.

(51) Everybody didn't leave. $\forall > \neg; \neg > \forall$

However, for a small number of languages this is not the case. For most speakers of Dutch (and several Northern German varieties), this reconstructed reading is not available (cf. Zeijlstra 2004; Abels & Martí 2010). The same holds for (Levantine) Arabic and Japanese.

- (52) *Dutch*
 Iedereen vertrok niet.
 everybody left not $\forall > \neg; * \neg > \forall$
 ‘Nobody left.’
- (53) *Jordanian Arabic*
 Kul t-tulaab ma mashu.
 all the-students not walked $\forall > \neg; * \neg > \forall$
 ‘No student walked.’
- (54) *Japanese*
 Zen’in-ga sono testo-o uke-nakat-ta.
 all-NOM that test-ACC take-not-PAST $\forall > \neg; * \neg > \forall$
 ‘Nobody took that test.’

This observation has never received a satisfactory explanation, but directly follows once universal quantifiers in Dutch, Northern German, Levantine Arabic and Japanese are taken to be PPIs. Focusing here on the Dutch example, if *iedereen* is a PPI, it must be c-commanded by EXH at surface structure, and reconstructing it below negation would result in the contradictory reading EXH > NEG > \forall , thus providing a simple solution for this hitherto unsolved problem. Moreover, if *iedereen* is a PPI, the prediction that our analysis makes with respect to universal quantifiers, namely that universal quantifiers equipped with a feature [u σ] should also be attested (since nothing principled rules them out), is also confirmed.

However, how can we independently investigate whether Dutch *iedereen* is indeed a PPI? As shown by Szabolcsi (2004) and briefly discussed earlier, PPI-hood can be diagnosed in four different ways. First, PPIs should be fine under metalinguistic negation. This is indeed the case for Dutch *iedereen*, which may take scope under metalinguistic negation:

- (55) Speaker A: Iedereen gaat de kamer uit.
 everybody goes the room out
 ‘Everybody leaves the room.’
- Speaker B: Nee, onzin. Iedereen gaat niet de kamer uit;
 no, nonsense. everybody goes not the room out;
 alleen Jan en Piet.
 only Jan and Piet
 ‘No, nonsense. Not everybody leaves the room, only John and Piet do.’

Second, PPIs can take scope under clause-external negation. Again, this applies to *iedereen* as well.

- (56) Ik zeg niet dat iedereen vertrekt; alleen Jan vertrekt.
 I say not that everybody leaves; only Jan leaves
 ‘I’m not saying that everybody leaves; only John leaves.’

Third, PPIs can scope under negation if a proper intervener scopes between the PPI and its anti-licenser. In a way, we already saw that this is the case for those PPIs that appear under the surface scope of negation (since EXH then acts as an intervener), but more examples of intervention effects can be attested (see (18)). Example (57) can be true in a

situation where it is not always the case that everybody leaves the room. Note that this reading is facilitated by adding extra stress on *altijd* ('always').

- (57) Iedereen gaat niet altijd de kamer uit.
 everybody goes not always the room out
 'It is not always the case that everybody leaves the room.'

Finally, Szabolcsi (2004), following Baker (1970), shows that PPIs can be rescued under two anti-licensors (with the highest one being a non-anti-additive anti-licenser). Again, this is the case for Dutch *iedereen*. Take (58). The most salient reading of this sentence is the one where the speaker is surprised that some people left (i.e. that not everybody stayed). Again this reading is only possible if *iedereen* is allowed to reconstruct under negation.

- (58) Het verbaast me dat iedereen niet blijft.
 it surprises me that everybody not stays
 'It surprises me that not everybody stays.'

So, Dutch *iedereen*, when preceding negation, exhibits all the diagnostics of PPI-hood, thus allowing us to safely conclude that it is indeed a PPI in the classical sense (i.e. in the same way that *anybody* and *ever* are NPIs). The fact that it may appear under the scope of surface negation when negation precedes it immediately follows as this PPI introduces an exhaustifier, which in turn may act as an intervener between the PPI and its anti-licenser.^{10,11}

5 Universal PPIs and their differences in strength and locality

So far, we have not distinguished between PPIs of different strength. As Iatridou & Zeijlstra (2013) point out, various modal PPIs are subject to different strength requirements. Focusing on English, at least the following two PPIs can be distinguished: strong PPIs (banned from all DE contexts) and weak PPIs (banned from anti-additive contexts only). English *should* is a strong PPI. For instance, it cannot take scope below *few*, *at most N* or *only*, whereas English *must*, which is a weak PPI, can:

- (59) a. Few students should leave. should > few; *few > should¹²
 b. Few students must leave. must > few; few > must

¹⁰ Naturally, the question arises as to whether Levantine Arabic and Japanese also allow the inverse scope readings to emerge under DE predicates such as *doubt* or *surprise*. It seems that this is not the case in Arabic, but is indeed the case in Japanese. However, it is not clear whether these facts are indicative of the presence or absence of PPI-hood, as the general availability of Baker's tests in these languages has not been established yet. Hence, these facts are not conclusive.

¹¹ Another question that may arise is why there are so few universal quantifiers over individuals that are PPIs. I presume that this has to do with the fact that, even though they can be detected (and thus acquired), the cues that signal their PPI-hood are more obscure. Note that this is different for the discussed modals, where their PPI-hood is easier to detect (and thus to acquire), and whose number is significantly larger.

¹² To capture the difference between the two scopal construals, take a scenario where we know of two (out of twenty) students, namely Mary and Suzanne, that they ought to leave. In such a scenario, *few* > *should* holds, a scenario under which the sentence *Few students should leave* cannot be felicitously uttered. In a scenario where, according to the fire regulations, there are two students too many in the room (and therefore two students have to leave, no matter who) the scopal reading is *should* > *few*, which is indeed an available reading for *Few students should leave*. Similar scenarios can be used to differentiate between the readings in the other examples.

- (60) a. At most five students should leave. should > at most five; *at most five > should
 b. At most five students must leave. must > at most five; at most five > must
- (61) a. Only John should leave. should > only; *only > should
 b. Only John must leave. must > only; only > must

The distinction between strong and weak PPIs is reminiscent of the distinction between strong and weak NPIs. For instance, English *in years* is a strong NPI, since it can be licensed by anti-additive contexts only:

- (62) a. *I have seen him in years.
 b. *Somebody has seen him in years.
- (63) a. I haven't seen him in years.
 b. Nobody has seen him in years.
- (64) a. *Few people have seen him in years.
 b. *At most five students have seen him in years.
 c. *Only John has seen him in years.

By contrast, English *ever* is fine in all DE contexts:

- (65) a. *I ever saw him.
 b. *Somebody ever saw him.
- (66) a. I didn't ever see him.
 b. Nobody ever saw him.
- (67) a. Few people ever saw him.
 b. At most five students ever saw him.
 c. Only John ever saw him.

As noted by Collins & Postal (2014), in English strong NPIs are also strict NPIs, NPIs that must be licensed within a local syntactic domain, such as a finite clause or an island. Licensing such strong/strict NPIs across such locality boundaries, like adjunct islands, is not possible:

- (68) a. *I don't travel in order to have seen him in years.
 b. *I don't say that I have seen him in years.

Again, weak NPI licensing is not subject to such syntactic locality constraints and may apply across locality boundaries:

- (69) a. I don't travel in order to ever see him.
 b. I didn't say that I ever saw him.

Gajewski (2011) and Chierchia (2013) take the weak-strong distinction to lie in the distinction whether the exhaustifier looks only at the semantics of the NPI licenser, or also at its pragmatics (both the presupposition and the implicatures). Weak NPIs trigger

EXH to look at the semantics of the licenser only; strong NPIs also trigger EXH to look the licenser's pragmatics.

Let's illustrate this for *few N*. *Few students passed the exam* asserts that not many students passed the exam and implies that at least some students passed it. That the latter meaning contribution is an implicature and not part of the assertion is evidenced by the following example:

- (70) If few students pass the exam, the department is faced with budget cuts; this year no student passed the exam, so the department will face budget cuts.

If *few* meant 'not many, but some' there would be no reason why the department would face budget cuts in this case. This means that if one only looks at the semantics of *few N*, it is DE and it can shield an NPI from yielding a contradiction when embedded under an exhaustifier. However, the joint meaning contribution (the semantics and pragmatics) of *few N* is no longer DE. If few but still some students wear a shirt, it is not entailed that few but still some students wear a red shirt. Hence, when an exhaustifier takes the implicatures of the licenser into consideration, *few N* is no longer DE and cannot shield an NPI from yielding a contradiction when embedded under an exhaustifier either. Since anti-additive contexts do not give rise to such non-DE implicatures, such pragmatically active exhaustifiers can still shield NPIs under anti-additive contexts. This, then, may explain the difference between strong and weak NPIs.

This solution, however, faces two serious problems. First, it is unclear how it can be a property of an NPI that its exhaustifier must (not) consider the pragmatics of its licenser. And second, it is unclear how the locality conditions fit in. The latter is actually a problem for understanding weak NPI licensing in the first place, for how can it be possible that in (69), repeated below as (71), *ever*'s uninterpretable feature [$u\sigma$] can be checked off by EXH if this checking relation violates a syntactic locality constraint?

- (71) a. [EXH_[σ] I don't travel [in order to ever_[uσ] see him]]
 b. [EXH_[σ] I didn't say [that I ever_[uσ] saw him]]

In order to circumvent these problems, I suggest, slightly speculatively, to make the following amendments to Chierchia's theory, based on these NPI facts. Later on, I demonstrate that they make very precise and correct predictions in the domain of PPI-hood.

Let's assume that there are two ways in general to trigger the presence of an exhaustifier: one way is by syntactic agreement (as has been shown in this article at various places); another one would be the result of a pragmatic mechanism that states that if there have been introduced some (domain) alternatives in the sentence and they have not been applied to by any operator that applies to alternatives, as a last resort, the entire clause is exhaustified. Implicitly or explicitly, such mechanisms have been suggested in the literature before (cf. Krifka 1995). This amounts to the following picture:

- (72) a. Syntactic exhaustification: - is triggered by agreement;
 - is subject to syntactic locality constraints;
 - may apply at any position in the clause, provided its complement is of the right semantic type;
 b. Pragmatic exhaustification: - takes place as a last resort operation;
 - is not subject to syntactic locality constraints;
 - may apply at the CP level only (given that it is a last resort operation applying at propositional level).

- (74) EXH(+) > NEG > PPI Possible under both syntactic exhaustification
and pragmatic exhaustification

Now, for English, given the fixed position of modal auxiliaries in the clause, this may be hard to test, but other languages exhibit constructions that can be used to evaluate these predictions. As said before, Dutch exhibits V-to-C movement in main clauses only. We already established that whereas Dutch *moeten* behaves like a typical PPI in main clauses, it can easily appear under the scope of negation in embedded clauses. Dutch *moeten* is also a weak PPI:

- (75) *Dutch*
- a. Weinig mensen moeten vertrekken. few > must; must > few
few people must leave
'Few people must leave.'
- b. Hoogstens vijf mensen moeten vertrekken. at most 5 > must;
at most 5 people must leave must > at most 5
'At most 5 people must leave.'
- c. Alleen Jan moet vertrekken. only > must; must > only
only John must leave
'Only John must leave.'

This is in line with our predictions. But Dutch also exhibits a universal modal PPI meaning 'should' (of the form *would must*). This modal, however, is a strong PPI. The same applies to German *sollen* ('should').

- (76) *Dutch*
- a. Weinig mensen zouden moeten vertrekken. *few > should;
few people would must leave should > few
'Few people should leave.'
- b. Hoogstens vijf mensen zouden moeten vertrekken. *at most 5 > should;
at most 5 people would must leave should > at most 5
'At most 5 people should leave.'
- c. Alleen Jan zou moeten vertrekken. *only > should;
only Jan would must leave should > only
'Only Jan should leave.'
- (77) *German*
- a. Wenige Leute sollen gehen. *few > should;
few people should go should > few
'Few people should go.'
- b. Höchstens fünf Leute sollen gehen. *at most 5 > should;
at most 5 people should go should > at most 5
'At most 5 people should go.'
- c. Nur Hans soll gehen. *only > should;
only Hans should go should > only
'Only Hans should go.'

Now, the final prediction is that in an embedded clause (both Dutch and German exhibit V-to-C movement in main clauses only), these stronger PPIs, being pragmatically

exhaustified only, still must outscope negation. The pragmatic exhaustifier EXH can only be introduced at clausal/CP level. And, indeed they do:

(78) ... dat Jan niet zou moeten vertrekken *not > should; should > not
 ... that Jan not would must leave
 ‘... that Jan shouldn’t leave’

(79) ... dass Hans nicht gehen soll *not > should; should > not
 ... that Hans not go should
 ‘... that Hans shouldn’t go’

Hence, the evidence presented so far shows that when applied to the domain of PPI modals the suggested amendment to Chierchia’s theory that was independently necessary given the different syntactic and semantic behavior of weak and strong NPIs again makes correct predictions for the treatment of universal PPIs. Finally, note that this predicts that Dutch *iedereen* must also be a weak PPI (and not a strong PPI), as otherwise it would also behave PPI-like when appearing in object position.

6 Conclusions

To conclude, universal quantifier PPIs do exist, both in the domain of quantifiers over individuals and in the domain of quantifiers over possible worlds, as is predicted by Chierchia’s (2006, 2013) approach to NPI-hood, which in turn is based on Kadmon & Landman (1993), Krifka (1995) and Lahiri (1998). Since the exhaustifier that is induced by these PPIs can act as an intervener between the PPI and its anti-licenser (at least for weak PPIs), universal quantifier PPIs may appear in disguise and take scope below their anti-licenser. Their PPI-like behavior only becomes visible once they morpho-syntactically precede their anti-licenser. In addition, I provide a possible analysis for why this mechanism is restricted to weak PPIs only, based on some independently necessary amendments of Chierchia’s theory of NPIs.

Abbreviations

ACC = accusative, C = Complementiser, CP = Complementiser phrase, DE = Downward Entailing, EXH = exhaustifier, LF = logical form, NEG = negation, NOM = nominative, NPI = Negative Polarity Item, OP = operator, PPI = Positive Polarity Item, PRT = Particle, V = verb

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Competing Interests

The author has no competing interests to declare.

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