On NPI-licensing and the semantics of causal sentences

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1 Introduction
The goal of this paper is to account for the licensing of minimizers (e.g., lift a finger, give a damn) and weak NPIs (e.g., any and ever) in because-sentences. I propose that the key to the account for the puzzles presented here lies in an adequate semantics of because; therefore, a new semantics of because will be proposed in this paper.

The data to be discussed in this paper are shown in (1–3).

(1) a. *John did not marry any woman because he had money (but because he was afraid of being alone).
   b. John did not marry Sue because she had any money (but because he loved her).

(2) a. *John did not even lift a finger to help Sue because he married her (but because he was intimidated by her).
   b. *John did not marry Sue because she even lifted a finger to help him (but because he loved her).

(3) a. *Did John even lift a finger to help Sue because he married her?
   b. *Did John marry Sue because she even lifted a finger to help him?

In both (1) and (2), negation scopes over because. As (1) shows, in a negated because-sentence, while weak NPIs such as any and ever are licensed in the reasoning adverbial clause, they are ungrammatical in the main clause.1 (2) shows that, unlike weak NPIs, minimizers with overt even are ungrammatical in both the main and the reasoning adverbial clause in a negated because-sentence. (3a,b) are cases of yes-no question variants of because-sentences: just like in (2), in a yes-no question environment, minimizers with overt even are licensed in neither the main nor the reasoning adverbial clause.

(4) and (5) show that weak NPIs and minimizers are licensed in the scope of negation and in yes-no questions. Importantly, as (5b) shows, unlike weak NPIs, minimizers bring up a negative bias effect in a yes-no question (see Wilkinson 1996; Guerzoni 2003, 2004, a.o.): in (5b), only the negative answer is expected by the speaker. Comparing (1–3) with (4–5), we might wonder: (i) why because blocks the licensing of weak NPIs and minimizers in (1a) and (2–3), and (ii) why weak NPIs in the reasoning adverbial clause of a negated because-sentence (cf. (1b)) could escape the intervention of because. Note that the contrast in (1–2) and (5a–b) shows that minimizers and weak NPIs have different semantics. To account for the NPI phenomenon in (1–3), we should have different stories for cases of weak NPIs and minimizers (see Heim 1984; Lahiri 1998; Guerzoni 2003, 2004, a.o.).

(4) a. John didn’t offer Mary any help.
   b. John didn’t (even) lift a finger to help Mary.

1Throughout this paper, I refer to the cause in a because-sentence as the reasoning adverbial clause, and the consequent as the main clause.
(5)  a. S: Did John offer Mary any help?
    A1: Yes, he did.
    A2: No, he didn’t.

   b. S: Did John (even) lift a finger to help Mary?
    A1: # Yes, he did.
    A2: No, he didn’t.

In section 2, I lay out my assumptions regarding NPI-licensing. In section 3 I discuss Lewis’ semantics of causal dependency and show that this semantics is inadequate for because-sentences. A new semantics for because is then provided. In section 4 I show how this new semantics of because with the assumption regarding NPI-licensing in section 2 accounts for the NPI phenomenon in (1–3). The conclusion and an open question are in section 5.

2 On the licensing of weak NPIs and minimizers

2.1 Licensing weak NPIs

The licensing of negative polarity Items (NPIs) has been widely discussed in the semantics literature. In this paper, following von Fintel (1999), I assume that the licensing of NPIs is subject to Strawson-Downward Entailment (SDE) (see (6)).

    An NPI is only grammatical if it is in the scope of α such that [α] is SDE.

   b. Strawson Downward Entailingness (SDE):
    A function f of type ⟨σ, τ⟩ is Strawson-downward entailing iff for all x, y of type σ such that x ⇒ y and f(x) is defined: f(y) ⇒ f(x).

One example of an SDE operator licensing NPIs is only. As (7) shows, weak NPIs are licensed in the scope of “only NP”. The semantics in (8) assumed for only, “only NP” is a SDE operator, and the scope of “only NP” is a SDE context.

(7) Only John ate any vegetable.

(8) [only](x)(P) is defined only if P(x) = 1. If defined, [only](x)(P) = 1 iff ¬∃y ≠ x[P(y) = 1]

Note that the licensing condition in (6a) can only be seen as a necessary condition. Crucially, a licensing environment for negative polarity items can never be (Strawson) Upward-Entailing ((S)UE). This assumption is motivated by the contrast in (9). As (9) shows, while weak NPIs are grammatical in the restrictor of definite plurals (see (9b)), they are ungrammatical in that of definite singulars (see (9a)). This contrast can be accounted for in the following way: The restrictor of a definite plural is a strictly SDE environment; hence, weak NPIs are licensed in this environment. On the other hand, the restrictor of a definite singular is not only a SDE but also a SUE environment at the same time; therefore, definite singulars fail to license weak NPIs in their restrictors.

(9) a. *The student who has any books on NPIs is selling them.

   b. The students who have any books on NPIs are selling them.

2.2 Licensing minimizers

As mentioned above, the semantics of minimizers is different from that of weak NPIs, given the contrast in (1–2) and (5a,b). Following Heim (1984); Lahiri (1998) and others, I assume that minimizers are the combination of (covert or overt) even with the low endpoint on the pragmatic scale. The semantics of even is shown in (10).\(^3\)

\[
(10) \quad [\text{even}]^w(p) \text{ is defined only if}
\forall q((q \in C \land q \neq p) \rightarrow \text{Likelihood}(p)(w) < \text{Likelihood}(q)(w)).
\]

**Scalar Presupposition**

If defined, \([\text{even}]^w(p) = 1 \iff p(w) = 1\).

According to (10), even contributes nothing to the truth conditions, but invokes a scalar presupposition, which requires that the propositional argument of even (henceforth, the sister of even) must be the least likely proposition to be true among the alternatives in \(C\). The set of alternatives \(C\) is strictly determined by the focus and the scope of even at LF. Furthermore, I assume that even can take scope at LF through LF-movement across DE operators.\(^5\) Since only in DE contexts would a proposition with the low endpoint on the pragmatic scale become the least likely one to be true in the alternative set (where the alternatives refer to higher points on the same scale), minimizers are only grammatical in DE contexts. For example, in (11a), even moved across negation at LF (see (11b)). Since the sister of even entails all the other alternatives in \(C\), the scalar presupposition is satisfied and the minimizer is grammatical in (11a).

\[
(11) \quad \begin{align*}
\text{a. } \text{John did not (even) lift a finger to help Mary.} \\
\text{b. LF: } & [\text{even } [\neg [\text{John helped Mary to the [minimal]F degree}}]] \\
\text{c. The set of alternatives } C:
\{& \text{‘John did not help Mary to the minimal degree’}, \\
& \text{‘John did not help Mary to a slightly-higher-than-minimum degree’}, \\
& \ldots, \\
& \text{‘John did not help Mary to the maximal degree’}\}
\end{align*}
\]

On the other hand, in (12a), since the sister of even is entailed by all the other alternatives in \(C\), the scalar presupposition fails. Hence, the minimizer is ungrammatical in (12a).

\[
(12) \quad \begin{align*}
\text{a. } \ast \text{John (even) lifted a finger to help Mary.} \\
\text{b. LF: } & [\text{even } \text{[John helped Mary to the [minimal]F degree}}] \\
\text{c. The set of alternatives } C:
\{& \text{‘John helped Mary to the minimal degree’}, \\
& \text{‘John helped Mary to a slightly-higher-than-minimum degree’}, \\
& \ldots, \\
& \text{‘John helped Mary to the maximal degree’}\}
\end{align*}
\]

\(^3\)For more discussion on even, see Karttunen & Peters (1979); Rooth (1985); Wilkinson (1996) and others.

\(^4\)For any two propositions \(p\) and \(q\) such that \(p \neq q\), if \(p\) entails \(q\) \(\{w : w \in p\} \subseteq \{w : w \in q\}\), then \(p\) is less likely than \(q\) in any world.

\(^5\)For more discussion on the scope theory of even, see Karttunen & Peters (1979); Wilkinson (1996); Lahiri (1998) and others.
3 On *because*

The most widely assumed semantics for *because* is Lewis’ (1973) semantics, which treats *because* on a par with counterfactual conditionals. In this section, I will first review a Lewis-style semantics of *because* and show its inadequacy with respect to the data in (1–3). Then I will propose a new semantics for *because* which the following discussion is based on. Following Lewis’ (1973) semantics, the semantics of *because* can be stated as in (13). In (13), *q* corresponds to the main clause of *because*-sentences, and *p* corresponds to the reasoning adverbial clause. *A* is a function from possible worlds to sets of propositions (type ⟨⟨*s*, ⟨(*s*, *t*), *t*)⟩⟩). *R*(w) is an ordering source provided by the context in *w* which ranks all the worlds in ∩*A*(w) (the modal base) with respect to their closeness to the ideal world set up by *R*(w). According to this semantics, *because* carries a factivity presupposition on both the main and the reasoning adverbial clause. The truth condition of a *because*-sentence is paralleled with that of a counterfactual conditional.

(13) \[[*because*]^w,A,R(p)(q)\] is defined only if: (i) *w* ∈ *q*, and (ii) *w* ∈ *p*; when defined, \[[*because*]^w,A,R(p)(q)\] = 1 iff
∀*w* ′[*w* ′ ∈ Max((∩*A*(w)) ∩ ¬*p*)(*R*(w)) → *w* ′ ∈ ¬*q*],
where ∩*A*(w) is the set of accessible worlds from *w*, and Max((∩*A*(w)) ∩ ¬*p*)(*R*(w)) is the set of the “best”-worlds among the worlds in ∩*A*(w) in which ¬*p* is true with respect to the ordering source *R*(w).

However, it is not clear whether it is an appropriate move to apply this semantics when we consider the NPI phenomenon in *because*-sentences. The first problem concerns the difference between *because*-sentences and causatives constructions. Note that the motivation behind Lewis’ semantics is causative constructions like (14a). Though (14a) and (14b) seem to express the same meaning at first glance, they behave differently with respect to NPI-licensing when embedded in the scope of negation: while weak NPIs are licensed in both of the cause and consequent in a negated causative sentence, the occurrence of weak NPIs in both the main and reasoning adverbial clause of a negated *because*-sentence results in an ungrammaticality (see (15)).

(14)  a. Mary’s being in a bad mood caused John’s complaining.
      b. John complained because Mary was in a bad mood.

(15)  a. *It is not the case that any* storms caused *any* floods.
      b. *It is not the case that there were any* floods because *there were any* storms.

The second problem concerns the entailment property of *because*-sentences. According to the semantics in (13), the main clause of a *because*-sentence is a SDE (and only a SDE) context: as (16) shows, (16b) with the presuppositions of (16c) entails (16c). Following the licensing condition in (6a), the semantics incorrectly predicts that weak NPIs are licensed in the main clause of a *because*-sentence (see (17)).

(16)  a. \{*x* : *x* is a long book\} ⊆ \{*x* : *x* is a book\}
      b. John read a book because he was bored.
      Presuppositions: ‘John read a book’; ‘John was bored’
      c. John read a long book because he was bored.
      Presuppositions: ‘John read a long book’; ‘John was bored’
      d. (14b) + the presuppositions of (14c) → (14c)
a. *John read any book because he was bored.
b. *John had ever read a book because he was bored.

Due the inadequacy of the Lewis-style semantics of because, I propose a new semantics for because in (18), which is an important assumption in the analysis below for (1–3).

(18) \[
[w, A, R(w)](p, q) \text{ is defined only if: (i) } w \in q \text{ and } w \in \text{Max}(\cap A(w))(R(w)), \text{ and (ii) }
\text{Max}(\cap A(w))(R(w)) \subseteq q;
\text{when defined, } [w, A, R(w)](p, q) = 1 \text{ iff for all } w' \in \text{Max}(\cap A(w))(R(w)): w' \in p,
\text{where Max}(\cap A(w))(R(w)) \text{ is the set of the “best”-worlds in } \cap A(w) \text{ relative to } R(w).
\]

According to (18), the main clause of a because-sentence is a (S)UE and SDE context at the same time. As mentioned in section 2.1, since weak NPIs can never be licensed in a (S)UE context, the problem that the Lewis-style semantics faces in (17) is avoided. Note that, due the presupposition in (18ii), the main clause of a because-sentence retains its entailment pattern when embedded under negation. On the other hand, the reasoning adverbial clause is an UE context but a DE context in the scope of negation. The entailment properties of because-sentences according to (18) are summarized in (19).

(19) a. q because p

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b. not [q because p]

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4 Back to NPI-licensing problems in because-sentences

Now we have all the tools needed to account for the puzzles in (1–3). In this section, I will show how the new semantics of because in (18) with the assumptions regarding NPI-licensing in section 2 accounts for the NPI phenomenon in (1–3).

4.1 On the licensing of weak NPIs in negated because-sentences

As shown in (1) (repeated as (20) below), in a negated because-sentence, weak NPIs are licensed in the reasoning adverbial clause, but not in the main clause.

(20) a. *John did not marry any woman because he had money (but because he was afraid of being alone).
b. John did not marry Sue because she had any money (but because he loved her).

The contrast in (20) can be captured straightforwardly by the semantics of because in (18) with the SDE view on the licensing of weak NPIs. Due to the presupposition in (18ii), the main clause of a because-sentence retains its own entailment pattern in the scope of negation: it is still a (S)UE and SDE context. Though weak NPIs are grammatical in SDE contexts, crucially they cannot be licensed in (S)UE contexts. Therefore, the occurrence of weak NPIs in the main clause of a negated because-sentence is impossible.
(see (20a)). On the other hand, given that the reasoning adverbial clause is a DE (and crucially not a (S)DE) context in the scope of negation, weak NPIs are licensed in (20b).

### 4.2 On the licensing of minimizers in negated because-sentences

Now consider the case of minimizers in a negated because-sentence (see (2), repeated as (21)). As (21) shows, unlike weak NPIs, minimizers cannot be licensed in either the main or the reasoning adverbial clause.

\[(21)\]

\[a. \ *John \ did \ not \ even \ lift \ a \ finger \ to \ help \ Sue \ because \ he \ married \ her \ (but \ because \ he \ was \ intimidated \ by \ her.)\]

\[b. \ *John \ did \ not \ marry \ Sue \ because \ she \ even \ lifted \ a \ finger \ to \ help \ him \ (but \ because \ he \ loved \ her.)\]

To account for (21), it is important to see how even scope-interacts with negation and because in these examples. Due to the contrast in (22), I assume that, though even can scope over because through LF-movement, it cannot move across “not . . . because” at LF.

\[(22)\]

\[a. \ I \ called \ Mary \ because \ she \ was \ sick \ (and \ not \ because \ I \ like \ her); \ I \ gave \ her \ a \ ride \ because \ she \ was \ sick \ (and \ not \ because \ I \ like \ her); \ I \ even \ did \ her \ shopping \ for \ her \ because \ she \ was \ sick \ (and \ not \ because \ I \ like \ her)\]

\[b. \ I \ didn’t \ call \ Mary \ because \ she \ was \ sick \ (but \ because \ I \ like \ her); \ I \ didn’t \ give \ her \ a \ ride \ because \ she \ was \ sick \ (but \ because \ I \ like \ her); \ # \ I \ didn’t \ even \ do \ her \ shopping \ for \ her \ because \ she \ was \ sick \ (but \ because \ I \ like \ her)\]

Note that, though even cannot move across “not . . . because” at LF, it can scope over “not . . . because” at overt syntax, as (23) shows. Although the constraint on the LF-movement of even needs an explanation, this is beyond the scope of this paper.

\[(23) \ I \ didn’t \ call \ Mary \ because \ she \ was \ sick \ (but \ because \ I \ like \ her); \ I \ didn’t \ give \ her \ a \ ride \ because \ she \ was \ sick \ (but \ because \ I \ like \ her); \ I \ even \ didn’t \ do \ her \ shopping \ for \ her \ because \ she \ was \ sick \ (but \ because \ I \ like \ her)\]

With this assumption in mind, now consider (21a), the case of minimizers in the main clause of a negated because-sentence. There are two possible LFs for (21a) (see (24)): in (24a), the scope of even is limited to the main clause, whereas in (24b) even scopes over the whole because-sentence at LF, and stays within the scope of negation.\(^6\) In both of the possible LFs, the scalar presupposition can be satisfied in neither of them: in (24a) help is a UE predicate, and in (24b) the main clause of a because-sentence is a UE context. In both of LFs, the sister of even is entailed by all the other alternatives in the alternative set and is the most likely one to be true. Given that there is no LF under which the scalar presupposition of even can be satisfied, (21a) is ungrammatical.

\[(24) \]

\[a. \ [not \ [[because \ John \ married \ Sue] \ [even \ [John \ helped \ Sue \ to \ the \ [minimal]_F \ degree]]]]\]

\[a’. \ Alternatives:\]

\[\{‘John \ helped \ Sue \ to \ the \ minimal \ degree’, \]

\[‘John \ helped \ Sue \ to \ a \ slightly-more-than-minimum \ degree’, \]

\[\ldots, \]

\[‘John \ helped \ Sue \ to \ the \ maximal \ degree’\]

\(^6\)Note that the possibility that even moves across negation in (21) is excluded by the assumption motivated by the contrast in (22).
b. \[\text{not} \left[\text{even} \left[\left[\text{because} \text{ John married Sue}\right] \left[\text{John helped Sue to the } \text{[minimal]}_F \text{ degree}\right]\right]\right]\]

b'. Alternatives:

\{'\text{John helped Sue to the } \text{minimal} \text{ degree because he married her}',
\text{‘John helped Sue to a slightly-more-than-minimum degree because he married her'},
\ldots ,
\text{‘John helped Sue to the maximal degree because he married her'}\}

Now consider (21b), the case where minimizers occur in the reasoning adverbial clause of a negated \textit{because}-sentence. There are two possible LF s for (21b) as well: in (25a) the scope of \textit{even} is limited in the reasoning adverbial clause, while in (25b) \textit{even} scopes over the whole \textit{because}-sentence but stays within the scope of negation.

\begin{enumerate}
\item[(25)] a. \[\text{not} \left[\left[\text{because} \left[\text{even} \left[\text{Sue helped John to the } \text{[minimal]}_F \text{ degree}\right]\right] \left[\text{John married Sue}\right]\right]\right]\]
\item[(25)] b. \[\text{not} \left[\left[\text{because} \left[\text{Sue helped John to the } \text{[minimal]}_F \text{ degree}\right] \left[\text{John married Sue}\right]\right]\right]\]
\end{enumerate}

Note that \textit{help} is a UE predicate (as mentioned above), and the reasoning adverbial clause is a UE context. Hence, (21b) is ungrammatical for the same reason as (21a): in both of the LF s, the sister of \textit{even} is entailed by all the other alternatives. Hence, in neither of the LF s can the scalar presupposition of \textit{even} be satisfied.

4.3 On the licensing of minimizers in \textit{yes-no} questions of \textit{because}-sentences

Now consider (3) (repeated as (26)), the case of minimizers in \textit{yes-no} questions of \textit{because}-sentences. As (26) shows, in a \textit{yes-no} question environment, minimizers are ungrammatical in both the main and the reasoning adverbial clause.

\begin{enumerate}
\item[(26)] a. \*\text{Did John \textit{even} lift a finger to help Sue because he married her?}
\item[(26)] b. \*\text{Did John marry Sue because she \textit{even} lifted a finger to help him?}
\end{enumerate}

To account for (26), some additional assumptions must be mentioned. Following Guerzoni (2003, 2004), I assume that \textit{even} can have scope interaction with the trace of \textit{whether} in a \textit{yes-no} question. In (27a), \textit{even} moves across the trace of \textit{whether} at LF.\footnote{Since the negation in \textit{p}_2 in (27c) comes from the quantify-in of \textit{whether}, \textit{even} must move across the trace of \textit{whether} in (27) so that the scalar presupposition could be satisfied in \textit{p}_2.} In the possible answers generated from (27b) (see (27c)), since the scalar presupposition fails in the positive answer \textit{p}_1, only the negative answer \textit{p}_2 can be a felicitous answer to (27a).

Given that the trace of \textit{whether} serves as the place holder for polarity operators, I further assume that \textit{even} cannot move across \textit{because} and the trace of \textit{whether} together at LF.

\begin{enumerate}
\item[(27)] a. \textit{Did John (even) lift a finger to help Mary?}
\item[(27)] b. LF: \[\text{[Whether}_1 \left[\text{even} \left[\text{t}_1 \left[\text{John helped Mary to the } \text{[minimal]}_F \text{ degree}\right]\right]\right]\]
\item[(27)] c. \{\textit{p}_1 = \textit{even} \left[\text{John helped Mary to the } \text{[minimal]}_F \text{ degree}\right];
\textit{p}_2 = \textit{even} \left[\neg \left[\text{John helped Mary to the } \text{[minimal]}_F \text{ degree}\right]\right]\}
\end{enumerate}

With these two additional assumptions, (26) can be accounted for in the following way. For (26a), the case of minimizers in the main clause, there are two possible LF s:\footnote{Note that the possibility that \textit{even} moves across the trace of \textit{whether} in (26) has been excluded.} in (28a) the scope of \textit{even} is limited to the main clause of a \textit{because}-sentence; in (28b) \textit{even}...
scopes over the whole because-sentence, but stays within the scope of the trace of whether. Note that in none of the possible answers generated from these two LFs can the scalar presupposition of even be satisfied, given that help is a UE predicate, and the main clause of a because-sentence is a UE context. Since there is no LF under which (26a) can be felicitously answered, (26a) is ungrammatical.

\[(28)\]

a. \([\text{Whether}_i \ [t_i \ [\text{[because John married Sue] [even [John helped Sue to the [minimal]_F degree]]}]])]

\[a'. \{p_1 = [[\text{because John married Sue]} [even [John helped Sue to the [minimal]_F degree]]];
\]

\[p_2 = [\neg[[\text{because John married Sue]} [even [John helped Sue to the [minimal]_F degree]]]]]\]

b. \([\text{Whether}_i \ [t_i \ [\text{even [because John married Sue] [John helped Sue to the [minimal]_F degree]]}]])

\[b'. \{p_1 = [\text{even [because John married Sue] [John helped Sue to the [minimal]_F degree]]];
\]

\[p_2 = [\neg[\text{even [because John married Sue] [John helped Sue to the [minimal]_F degree]]]]\]

(26b), a case of minimizers in the reasoning adverbial clause, has two possible LFs as well (see (29)). (29a) is an illegitimate LF for the same reason as (28a). In (29b), since the reasoning adverbial clause is a UE context, the scalar presupposition fails in both of the possible answers generated. Given that there is no LF under which (26b) can be felicitously answered, (26b) is ungrammatical.

\[(29)\]

a. \([\text{Whether}_i \ [t_i \ [\text{[because [even [Sue helped John to the [minimal]_F degree]]] [John married Sue]]}]])

\[a'. \{p_1 = [[\text{because [even [Sue helped John to the [minimal]_F degree]]} [John married Sue]]);
\]

\[p_2 = [\neg[[\text{because [even [Sue helped John to the [minimal]_F degree]]} [John married Sue]]]]\]

b. \([\text{Whether}_i \ [t_i \ [\text{even [because Sue helped John to the [minimal]_F degree] [John married Sue]]}]])

\[b'. \{p_1 = [\text{even [because Sue helped John to the [minimal]_F degree] [John married Sue]]];
\]

\[p_2 = [\neg[\text{even [because Sue helped John to the [minimal]_F degree] [John married Sue]]]]\]

5 Conclusion and open question

In this paper, I provided an account for the NPI phenomenon in because-sentences by investigating the semantic and syntactic properties of because. Instead of assuming a Lewis-style semantics, the analysis above heavily relies on the new semantics of because proposed above. One question that comes with this new semantics of because concerns the relation between counterfactual conditionals and because-sentences. As observed in the literature, it seems that (30a,b) have intuitively similar truth conditions. In the Lewis-style semantics for because, the inference relation in (30) can be captured straightforwardly, given that, under this semantics, “if \(p\), then \(q\)” and “not-\(q\) because not-\(p\)” have the same
truth conditions. In fact, this inference relation between *because*-sentences and counterfactual conditionals is one of the motivations to analyze *because*-sentences as having the truth conditions of a counterfactual conditional.

(30)  

a. If *p*, then *q*  
   *If the United States had used nuclear arms in Vietnam, it would have won the war.*

b. not-*q* because not-*p*  
   *The United States did not win the war because it did not use nuclear arms.*

With the new semantics of *because* in (18), I suggest that the inference between “if *p*, then *q*” and “not-*q* because not-*p*” shown in (30) could be derived as an implicature through presupposition suspension: when (30a) is asserted, it implicates (30b) with the suspension of the presupposition on the “best”-worlds. Due space limitations, I do not provide details here, and I refer the readers to Hsieh (2009) for more discussion.

REFERENCES


