Gender in conditionals*

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Abstract The 3sg pronouns "he" and "she" impose descriptive gender conditions (being male/female) on their referents. These conditions are standardly analyzed as presuppositions (Cooper 1983, Heim & Kratzer 1998). Cooper argues that, when 3sg pronouns occur free, they have *indexical* presuppositions: the gender condition must be satisfied by the pronoun's referent in the actual world. In this paper, we consider the behaviour of free 3sg pronouns in conditionals and focus on cases in which the pronouns' gender presuppositions no longer seem to be indexical and project locally instead. We compare these cases to previously reported shifty readings of indexicals in so-called "epistemic conditionals" (Santorio 2012) and propose a unified account of locally projected gender presuppositions and shifty indexicals based on the idea that indicative conditionals are Kaplanian monsters.

Keywords: conditionals, pronouns, gender presuppositions, context, indexicals, monsters

1 Indexical gender presuppositions

Free third person singular (3sg) pronouns have been reported to have *indexical gender presuppositions*. More precisely, Cooper (1983) claims that

IGP. free (non-anaphoric) 3sg pronouns presuppose that their descriptive gender-specific content (human male/female) is satisfied by their referents in the actual world.

For example, you cannot utter (1) felicitously to say of an individual who is known to be a woman that there is a possibility that she is male and American:

(1) ??It could be that *he* is American (pointing at Scarlett).

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Analogously, you cannot utter (2) felicitously in a context in which the conversational participants know that Scarlett is a woman and Jones mistakenly believes that she is a man:

(2) ??Jones believes that *he* (pointing at Scarlett) is a university professor.

Pronouns anaphoric to proper names also display indexical presuppositions. For example, (3) is infelicitous, where "he$_j$" is anaphoric to the proper name "Scarlett$_j$" (a woman's name):

(3) ??John$_i$ didn't realize that Scarlett$_j$ was a woman. He$_i$ thought that he$_j$ liked him$_i$. (Sharvit 2008)

Yanovich (2010) and Sudo (2012) (among others) remark that counterfactuals like (4) and (5), uttered in a context in which the conversational participants know that Sasha is a girl, also support the view that pronouns anaphoric to proper names have indexical presuppositions:

(4) If Sasha$_i$ were a boy, I would buy her$_i$ a doll.

(5) ??If Sasha$_i$ were a boy, I would buy him$_i$ a doll.

Yet, the pronouns display no indexical presuppositions in indicative conditionals (6)-(7) (from Yanovich 2010), uttered in a context in which Sasha's gender is not known (the Russian name "Sasha" can be the name of either a boy or a girl):[1]

(6) If Sasha$_i$ is a boy, I'll buy him$_i$ a doll.

(7) If Sasha$_i$ is a girl, I'll buy her$_i$ a toy car.

An intuitive characterization of (6)-(7) is that the gender presuppositions of the pronouns are met in the possible worlds described by the antecedents of the conditionals.

One might suggest that the contrast between (4)-(5), on the one hand, and (6)-(7), on the other, depends on the latter being *indicative* conditionals: somehow, the gender presupposition of 3sg pronouns can be locally satisfied in indicative conditionals, but not in counterfactual conditionals. However, as Magdalena Kaufmann pointed out to us (p.c.), one problem with this suggestion is that indicative conditionals (8)-(9) seem to require that the gender presuppositions of the pronouns be met in the actual world and not in the possible world(s) described by their antecedents:

1 The contrast between indicative and counterfactual conditionals with respect to the projection behaviour of the gender presupposition of pronouns was also observed by Geurts (1999: p. 68-9).

(8) If John$_i$ undergoes an operation to become a woman, we'll buy him$_i$ a toy car.

(9) ??If John$_i$ undergoes an operation to become a woman, we'll buy her$_i$ a toy car.

These data show that the behaviour of free 3sg pronouns in conditionals is puzzling. On the one hand, indicative conditionals (6)-(7) allow the presupposition of pronouns to be locally satisfied in a world other than the actual world. On the other hand, (4)-(5) indicate that local satisfaction is not an available option for counterfactual conditionals. Moreover, as (8)-(9) show, local satisfaction seems also to be unavailable for some indicative conditionals.

Our paper is organized as follows. Section 2 sets the stage: we present a version of the indexical presupposition analysis of 3sg pronouns (for short, IPA) and we show that this analysis, combined with a standard intensional semantics for conditionals, fails to account for the contrast between (4)-(5) and (6)-(7). In section 3 we discuss a way to deal with this problem by combining IPA with a trivalent version of the extensional analysis of indicative conditionals proposed by Jackson (1979, 1981, 1987) and Lewis (1986). We reject this extensional way out for two reasons: (i) it suggests that there are different explanations for the failure of the same inference patterns in indicative and subjunctive conditionals; (ii) it fails to account for the behaviour of first person and temporal indexicals described by Santorio (2012) (which we discuss in section 6). Section 4 raises a problem for IPA which is independent of conditionals and concerns the behaviour of 3sg pronouns bound in the scope of modal operators. In section 5 we articulate our proposal. First, we introduce the presuppositional analysis of 3sg pronouns by Del Prete & Zucchi (2017) in order to capture generalization IGP without running into the problem raised in section 4. Then, we present an analysis of indicative conditionals as monstrous operators, building on a suggestion by Weatherson (2001) and Nolan (2003). Our monstrous analysis is similar in spirit to Santorio's (2012), but differs from the latter since it treats indicative conditionals *uniformly* as Kaplanian monsters. We show how our analysis accounts for Yanovich's conditionals (6)-(7) and for the observed difference in projection behaviour between these conditionals and Kaufmann's (8)-(9). In section 6 we show how our proposal applies to cases of "indexical shift" involving first person pronouns and temporal indexicals. We argue that, besides accounting for these cases, our analysis is empirically more adequate than Santorio's. Section 7 presents some concluding remarks.

2 Setting the stage

2.1 The indexical presupposition analysis of 3sg pronouns

We subscribe to the following common views:

- 3sg pronouns are variables,
- their gender-specific descriptive content is a presupposition, analyzed as a definedness condition.

Following Kaplan (1989), let's assume that a context c contains a world coordinate c_w and a time coordinate c_t, and that denotation is relative to a context, an assignment function g (which maps individual variables to individuals from the domain of interpretation) and a circumstance of evaluation consisting of a world-time pair. One way to capture generalization IGP is to assume the semantic rules i-ii below, which constitute what we call "the indexical presupposition analysis":

- *The indexical presupposition analysis* (IPA)

i. $[\![\text{he}_i]\!]_{c,g,<w,t>} = g(x_i)$, if $g(x_i)$ is male at $<c_w, c_t>$; undefined otherwise.

ii. $[\![\text{she}_i]\!]_{c,g,<w,t>} = g(x_i)$, if $g(x_i)$ is female at $<c_w, c_t>$; undefined otherwise.

Assuming that the verb "think" requires that the denotation of the complement clause be defined with respect to the worlds compatible with the beliefs of the subject, (as shown in (10) below), IPA correctly predicts that (3) (repeated below) is infelicitous, since the definedness condition of the pronoun "he$_j$" is not met (assignment g in (10) assigns Scarlett to the variable "x_j" and John to the variable "x_i"):

(3) ??John$_i$ didn't realize that Scarlett$_j$ was a woman. He$_i$ thought that he$_j$ liked him$_i$.

(10) $[\![\text{He}_i \text{ thought that he}_j \text{ liked him}_i]\!]_{c,g,<w,t>}$ is defined only if $\forall w'$ compatible with what John thinks in w at a time t' in the past of t, $[\![\text{he}_\text{j} \text{ likes him}_\text{i}]\!]_{c,g,<w',t'>}$ is defined.

Indeed, according to rule i of IPA, the gender presupposition of the pronoun "he$_j$" in the scope of "think" must be met relative to the world and the time of the context, not relative to the circumstance of evaluation $<w', t'>$. Since assignment g assigns Scarlett to the variable "x_j", it follows that:

(11) $\forall w'$ compatible with what John thinks in w at a time t' in the past of t, $[\![\text{he}_\text{j} \text{ likes him}_\text{i}]\!]_{c,g,<w',t'>}$ is defined only if Scarlett is male in c_w at c_t.

Since in the world of the context at the time of the context Scarlett is a woman, this analysis predicts that (3) is not acceptable. (By a similar reasoning, it also follows that (1)-(2) are unacceptable).

2.2 Enter a standard intensional semantics for conditionals

Paired with the standard intensional semantics for conditionals given below, IPA predicts the contrast of acceptability between (4) and (5), uttered in a context in which the conversational participants know that Sasha is a girl (we repeat the relevant sentences below):

- *Stalnakerian Semantics*

i. $[\![if\ \varphi, \psi]\!]_{c,g,<w,t>}$ is defined only if $[\![\psi]\!]_{c,g,<w',t>}$ is defined, where w' is the world closest to w such that $[\![\varphi]\!]_{c,g,<w',t>} = 1$.

ii. If $[\![if\ \varphi, \psi]\!]_{c,g,<w,t>}$ is defined, then $[\![if\ \varphi, \psi]\!]_{c,g,<w,t>} = 1$ iff $[\![\psi]\!]_{c,g,<w',t>} = 1$, where w' is the world closest to w such that $[\![\varphi]\!]_{c,g,<w',t>} = 1$.

(4) If Sasha$_1$ were a boy, I would buy her$_1$ a doll.

(5) ??If Sasha$_1$ were a boy, I would buy him$_1$ a doll.

Indeed, the gender presupposition of the pronoun in the consequent of the conditional must be met relative to the world and the time of the context. Since in this world at this time Sasha is female, the analysis predicts that (5) is not acceptable.

However, the combination of IPA and Stalnakerian Semantics incorrectly predicts that one of (6)-(7) (repeated below) ends up undefined and should thus be infelicitous:

(6) If Sasha$_i$ is a boy, I'll buy him$_i$ a doll.

(7) If Sasha$_i$ is a girl, I'll buy her$_i$ a toy car.

Indeed, suppose that Sasha is a girl in the world and at the time of the context c: by Stalnakerian Semantics, (6) is predicted to be true in c, relative to assignment g, just in case $[\![\text{I'll buy him}_i \text{ a doll}]\!]_{c,g,<w',c_t>} = 1$, where w' is the world closest to c_w such that $[\![\text{Sasha}_i \text{ is a boy}]\!]_{c,g,<w',c_t>} = 1$. Since $g(x_i)$ (= Sasha) is female at $<c_w, c_t>$, by rule i of IPA $[\![\text{him}_i]\!]_{c,g,<w',c_t>}$ is undefined and $[\![\text{I'll buy him}_i \text{ a doll}]\!]_{c,g,<w',c_t>}$ will thus also end up undefined. Suppose now that Sasha is a boy in the world and at the time of the context: by a parallel reasoning, Stalnakerian Semantics, paired with rule ii of IPA, predicts that (7) ends up undefined.

3 An extensional way out

3.1 Material conditionals, trivalence, robustness

In this section, we discuss a way of dealing with (4)-(9) based on an extensional semantics for indicative conditionals. Jackson (1987) points out that, while counterfactual (12) makes perfect sense, the corresponding indicative (13) is incoherent:

(12) If Oswald had not shot Kennedy, things would be different today from the way they actually are.

(13) ??If Oswald did not shoot Kennedy, things are different today from the way they actually are.

The same contrast also holds between counterfactuals and indicatives whose antecedent and consequent describe future events.[2] The following examples, from Weatherson (2001), illustrate the point:

(14) If Warren Beatty were to become the next president, things would be different from the way they actually will be.

(15) ??If Warren Beatty becomes the next president, things will be different from the way they actually will be.

The moral drawn by Jackson is that indicatives, unlike counterfactuals, are not intensional, that is, they do not introduce a distinction between the closest world in which the antecedent is true and the actual world.[3] This is why the indicatives in (13) and (15) are incoherent: it cannot be that the way things are (will be) in the actual world differs from the way things are (will be) in the actual world.[4]

Jackson thinks that, from the point of view of their truth-conditions, indicative conditionals are equivalent to material conditionals, namely he proposes the following analysis for indicatives:

- *Material conditional analysis of indicatives* (MCA)
  An indicative conditional ⌜If φ, then ψ⌝ is truth-conditionally equivalent to the disjunction ⌜Either not-φ or ψ⌝.

The question that we address next is whether MCA fares better than Stalnakerian Semantics in accounting for the way the gender presuppositions of pronouns project in (6)-(7).

2 We'll come back to these conditionals in section 6.3.

3 As Jackson (1987: p. 75) puts it, "indicative conditionals do not take us from the actual world at all."

4 More precisely, according to Jackson, these conditionals are anomalous because the probability that they are true would not be high, if it came to be known that their antecedent is true. We'll come back to this in footnote 5.

By rules i-ii of IPA, sentences containing 3sg pronouns may be true, false or undefined. We can preserve the spirit of MCA in a three-valued semantics by assuming that the truth-conditions of disjunction ⌜Either φ or ψ⌝ are given by the following rule:

- *Strong Kleene*
  ⌜Either φ or ψ⌝ is true (relative to $c, g, < w, t >$) if one of its disjuncts φ, ψ is true (relative to $c, g, < w, t >$), no matter whether the other disjunct is true, false or undefined (relative to $c, g, < w, t >$).

MCA predicts that (6)-(7) are equivalent to (16)-(17), respectively:

(16) Either Sasha$_i$ is not a boy or I'll buy him$_i$ a doll.

(17) Either Sasha$_i$ is not a girl or I'll buy her$_i$ a toy car.

It is easy to show that, by Strong Kleene, these disjunctions can both be true (hence, defined). Indeed, suppose that Sasha is a boy and I'll buy him a doll. Then (16) is predicted to be true because its right disjunct is true, and (17) is also predicted to be true because its left disjunct is true. Supposing that Sasha is a girl and I'll buy her a toy car, the truth of (16)-(17) is explained in a parallel way.

What happens if we apply MCA + Strong Kleene to indicative conditionals (8)-(9) (repeated below)?

(8) If John$_i$ undergoes an operation to become a woman, we'll buy him$_i$ a toy car.

(9) ??If John$_i$ undergoes an operation to become a woman, we'll buy her$_i$ a toy car.

Let's focus on (9). MCA predicts that (9) is equivalent to (18):

(18) Either John$_i$ will not undergo an operation to become a woman or we'll buy her$_i$ a toy car.

Supposing that John will not undergo the operation, the first disjunct of (18) is true, therefore (by Strong Kleene) (18) is also true and conditional (9) – equivalent to (18) on MCA – is so predicted to be true, hence defined. In other terms, if the antecedent of (9) is false, MCA + Strong Kleene incorrectly predicts that (9) is defined. Therefore, if the antecedent of (9) is known to be false, the prediction is that (9) should be assertable, contrary to our intuition.

The prediction that an indicative conditional should be true if its antecedent is false is a familiar problem for MCA, and it carries over to MCA + Strong Kleene. This analysis can be rescued if, following Jackson, we require that, to be assertable, an indicative conditional must be *robust relative to its antecedent*:

- *Assertability condition on indicatives* (Robustness)

  An indicative ⌜If φ, then ψ⌝ is *robust* relative to φ iff the (subjective) probability of the truth of ⌜If φ, then ψ⌝ is high, and it would stay high also if it came to be known that φ is true.

This condition, paired with MCA + Strong Kleene, predicts that knowledge that the antecedent is false is no longer sufficient to assert the conditional. For example, (19) below is not assertable, since the subjective probability of the truth of (19) would not stay high if it came to be known that its antecedent is true (since there is no relation between New York being in Australia and Rome being in France):

(19) If New York is an Australia, Rome is in France.

Let's now go back to problematic conditional (9). Suppose we think it likely that John will not undergo the operation. Then, the subjective probability of (9) is high (since the first disjunct in (18) is likely to be true). However, if we were to learn that John will undergo the operation, the subjective probability of the truth of (9) would not stay high, because we would know that the first disjunct in (18) is false and the second disjunct is undefined, hence not true (since the presupposition of "her$_i$" that John is female at the world and time of utterance is not met). Thus, once Robustness is assumed, MCA + Strong Kleene correctly predicts (9) to be unassertable. Notice, on the other hand, that no such prediction of unassertability is made for (6)-(7). Indeed, suppose that (a) we think it likely that Sasha is a girl, but (b) in case we are wrong, we'll certainly give Sasha a doll. Given (a), the subjective probability of (6) is high (since the first disjunct in (16) is likely to be true). Moreover, if we were to learn that Sasha is a boy, the subjective probability of the truth of (6) would still be high, since we would be confident that we are in a context in which the presupposition of "him$_i$" that Sasha is male is met and the second disjunct in (16) is likely to be true. By a parallel reasoning, we may show that (7) could satisfy Robustness.

To sum up, given the indexical presupposition analysis of 3sg pronouns (IPA), pairing Jackson's trivalent extensional analysis of indicatives (MCA + Strong Kleene + Robustness) with a standard intensional semantics for counterfactuals (Stalnakerian Semantics) would allow us to capture the projection behaviour of the pronouns' gender presuppositions in (4)-(9). So, why don't we stop here?[5]

5 Notice that the proposal sketched in this section also explains why (13) is anomalous:

3.2 Why we don't stop here

How indicative conditionals should be analyzed is controversial. As we have just seen, Jackson argues that indicatives should be analyzed as material conditionals and subjunctives should be given a possible worlds semantics (see also Lewis 1976, 1986, among others). Other authors (Stalnaker 1968, 1975, Kratzer 1986, 2012, for example) argue that both indicatives and subjunctives should be given a possible worlds semantics. A problem for the mixed account is that it fails to provide a *uniform* reason for the fact that both indicatives and subjunctives fail to license inference patterns like hypothetical syllogism, contraposition, and strengthening of the antecedent; indeed, the mixed account predicts that the inference patterns in question are invalid for subjunctives but valid and pragmatically unacceptable for indicatives.[6] This is one reason why, although matters are not one-sided, we would not be satisfied with an account of the gender facts that combined Jackson's extensional semantics for indicatives with a Stalnakerian intensional semantics for subjunctives. Besides such metatheoretical considerations, there are independent reasons to assume that indicatives *do* "take us from the actual world" after all. These reasons have to do with the shifty behaviour of first person and temporal indexicals in indicative conditionals, first described and analyzed in Santorio (2012). We'll discuss them in section 6.

On these grounds, we are going to pursue an account based on an intensional analysis of indicatives. According to it, indicatives contrast with subjunctives in that the former are Kaplanian monsters, unlike the latter. We will argue that not only can this account capture the data discussed so far, but it also delivers a uniform reason for the failure of the same inference patterns in indicative and subjunctive conditionals, and it predicts the way first person and temporal indexicals behave in indicative conditionals. Before turning to our account, however, we first point out a problem that the indexical presupposition analysis runs into independently of conditionals.

4 A problem for the indexical presupposition analysis of 3sg pronouns

In section 2.2, we considered a problem that arises when combining IPA with a standard intensional analysis of indicatives. But IPA also runs into problems of its

(13) ??If Oswald did not shoot Kennedy, things are different today from the way they actually are.

Indeed, since it cannot be the case that things are different from the way they are, the second disjunct in the equivalent disjunction (i) is necessarily false, thus the subjective probability of the truth of (13) would not stay high if it came to be known that the antecedent of (13) is true.

(i) Either Oswald shot Kennedy or things are different today from the way they actually are.

6 For example, Jackson (1987: pp. 78-85) claims that, although these inference patterns are valid for indicatives, they may nevertheless lead from assertable premises to conclusions that are not assertable.

own, independently of conditionals. Del Prete & Zucchi (2017: p. 15) consider the following example:

(20) [While watching the 1980 Summer Olympics on TV, Jones regretfully observes that, if the United States had taken part in the Olympics, they would have certainly won some gold medals in boxing. Then, he utters the following sentence:]
It could have been that *every US gold medalist*$_i$ had defeated a Russian who challenged *him*$_i$.

They point out that in this case the descriptive gender content of the pronoun "him$_i$" must be satisfied in the possible world introduced by the possibility modal, not in the actual world. Now, IPA predicts the following definedness conditions for (20) (where "it could have been that" is translated as "$\Diamond$", "US gold medalist" as "G", and "defeats a Russian who challenges him$_i$" as "$D(him_i)$"):[7]

(21) $[\![\Diamond\ every\ x_i\ G(x_i)\ D(\text{him}_i)]\!]_{c,g,<c_w,c_t>}$ is defined
only if, for all w that are accessible from c_w, $[\![every\ x_i\ G(x_i)D(\text{him}_i)]\!]_{c,g,<w,c_t>}$ is defined
only if, for all w that are accessible from c_w, $[\![D(\text{him}_i)]\!]_{c,g',<w,c_t>}$ is defined for every g' such that $g'[x_i]g$ and $[\![G(x_i)]\!]_{c,g',<w,c_t>} = 1$
only if, for all w that are accessible from c_w, every individual which is a US gold medalist at w, c_t is male at $<c_w, c_t>$.

This prediction is incorrect: it requires that, for (20) to be true non vacuously, there must be some male individuals in the actual world such that there is some world in which they are US gold medalists at the 1980 Summer Olympics and they defeat the Russians who challenge them; however, (20) is only about individuals who are US gold medalists at the 1980 Summer Olympics in the counterfactual world of the modal, and it is *those* individuals who are presupposed to be male (recall that no US athlete participated in the actual games).[8] According to Del Prete & Zucchi

7 The definedness conditions in (21) are derived by assuming the following plausible definedness conditions for modal formulae with a (non-epistemic) possibility operator and for universally quantified formulae:

(i) $[\![\Diamond\varphi]\!]_{c,g,<w,t>}$ is defined only if $[\![\varphi]\!]_{c,g,<w',t>}$ is defined for all w' that is accessible from w.

(ii) $[\![every\ \nu\ \Phi\ \Psi]\!]_{c,g,<w,t>}$ is defined only if $[\![\Psi]\!]_{c,g',<w,t>}$ is defined for every g' such that $g'[\nu]g$ and $[\![\Phi]\!]_{c,g',<w,t>} = 1$.

8 Del Prete & Zucchi point out that this problem cannot be solved simply by requiring that the descriptive content of 3sg pronouns be satisfied at the world and time *of the circumstance* of evaluation. This would amount to assuming the following clauses for 3sg pronouns (see Sudo 2012: p. 41):

(i) $[\![he_i]\!]_{c,g,<w,t>} = g(x_i)$ if $g(x_i)$ is male at $<w,t>$, and it's undefined otherwise.

(2017: p. 17), here one faces a fundamental problem that arises for *any* account that treats bound and free uses of third person pronouns as occurrences of the same lexical items: while free uses of third person pronouns provide compelling reasons to assume that the descriptive gender content of the pronouns should be met in the world of the context, bound uses of the same pronouns show that this need not be the case.

So, if this is correct, in order to deal with the presuppositional behaviour of 3sg pronouns both a revision of Stalnakerian Semantics for indicative conditionals and a revision of IPA are called for. We head toward this goal in the next section.

5 Our proposal

5.1 A variablist account of 3sg pronouns

Before presenting our analysis of indicatives, we introduce a revision of IPA based on the proposal by Del Prete & Zucchi (2017) to deal with the problem posed by (20).[9] The proposal is framed in a Kaplanian two-dimensional semantics and is based on the following underlying assumptions:[10] (a) the semantic value of sentences containing free pronouns in a context of utterance is assignment sensitive (formally: their semantic value in a context is not a proposition, but a function from variable assignments to propositions); (b) context specifies a variable assignment and the proposition expressed by a sentence containing free 3sg pronouns in a context is the proposition one gets when one evaluates the sentence relative to the variable assignment of the context; (c) intensional operators manipulate the world-time coordinates of the circumstance; (d) quantifiers manipulate the assignment coordinate of the circumstance.

More formally, we may spell out the proposal as follows:

A1. *Assignment as a contextual coordinate*
A context of utterance c specifies a variable assignment c_g as one of its coordinates.

(ii) $[\![she_i]\!]_{c,g,<w,t>} = g(x_i)$ if $g(x_i)$ is female at $<w,t>$, and it's undefined otherwise.

This interpretation predicts that it should be possible to point at a woman and utter (iii) to claim that there is some possible circumstance in which she is a male university professor:

(iii) He could have been a university professor.

However, (iii) is not felicitous in a context of this kind.

9 The proposal considered here differs minimally from Del Prete and Zucchi's in structuring variable assignment functions by introducing a temporal dimension in addition to a possible world dimension. This change is needed to deal with Kaufmann's examples.

10 Assumptions (a)-(b) provide what is called a *variablist* account of free 3sg pronouns. Rabern 2012 advocates a similar variablist account for sentences containing demonstratives.

A2. *Assignment as a circumstance coordinate*
A circumstance of evaluation includes a variable assignment as one of its coordinates.

A3. *Modally parameterized assignments*
Variable assignments are parameterized to a function s from individual variables to world-time pairs (called *the modal component of the assignment*), so they have the form g^s. The following principle is assumed, establishing a relation between the individual $g^s(x_i)$ and the world-time pair $s(x_i)$ (for any assignment function g^s and individual variable x_i):

Principle of localization
$g^s(x_i)$ is an individual *inhabiting* the world-time pair $s(x_i)$.

A4. *Quantifiers shift the assignment of the circumstance*
The formula in the scope of a quantifier $Q\nu$ must be true relative to an assignment h^s identical to the assignment of the circumstance except for the fact that: (a) the modal component s of h^s assigns to the bound variable ν the world and time of the circumstance; (b) the individual assigned to ν by h^s may differ from the one assigned to ν by the assignment of the circumstance.

A5. *Intensional operators shift the world and time of the circumstance*
Modal, temporal and belief operators require evaluating the formulae to which they apply with respect to worlds and times different from the world and time of the circumstance of evaluation.

A6. *Variablism*
The value of 3sg pronouns is fixed by the assignment of the circumstance of evaluation. More precisely, the denotation of 3sg pronouns is stated as follows (where $<g^s,w,t>$ is a circumstance of evaluation, encompassing an assignment function coordinate besides a world and a time coordinate):

- $[\![\text{he}_i]\!]_{c,<g^s,w,t>} = g^s(x_i)$ if $g^s(x_i)$ is male in $s(x_i)$, and it's undefined otherwise.
- $[\![\text{she}_i]\!]_{c,<g^s,w,t>} = g^s(x_i)$ if $g^s(x_i)$ is female in $s(x_i)$, and it's undefined otherwise.

A7. *Truth in Context*
A sentence is true in a context c iff the semantic value it expresses in c is true at the time, world, and assignment of the context. The assignment provided by the context is specified thus:

Contextual assignment
c^s_g, where $s(x_i) = <c_w, c_t>$, for every variable x_i.

This account uniformly treats bound and free occurrences of 3sg pronouns as variables, namely bound and free occurrences are instances of the same lexical item. One consequence of the account is that, if a pronoun occurs free, its descriptive gender content must be satisfied in the world and at the time of the context of utterance, thus capturing generalization IGP. We can see why this generalization follows by means of the following reasoning. By the definition of Truth in Context in A7, the circumstance of evaluation is initialized to the world, time and assignment of the context. By the principle of contextual assignment in A7, the assignment of the context associates each variable with world and time of the context. Since by A6 the denotation of 3sg pronouns requires their descriptive content to be met at the world-time pair specified by the (modal component of the) assignment of the circumstance, then, in absence of operators shifting the assignment of the circumstance, the latter remains identical to the assignment of the context and the descriptive content of 3sg pronouns must be satisfied at the world-time pair of the context. Since by A5 modal and belief operators do not change the assignment of the circumstance (only quantifiers do), it follows that (1)-(3) are correctly predicted to require that the denotation of "he" be male in the world and at the time of the context.

On the other hand, the pronoun "him$_i$" in (20) is bound by the quantifier *every US gold medalist*; by A4, this quantifier requires that the formula in its scope be defined with respect to an assignment h identical to the assignment of the circumstance except for the fact that (a) the modal component of h assigns to x_i the world and time of the circumstance and (b) the individual denoted by x_i under h may differ from the one assigned to x_i by the assignment of the circumstance. Since the universally quantified sentence in (20) is in the scope of a possibility operator, the world at which the quantified sentence is evaluated is the counterfactual world introduced by that operator. Thus, the descriptive content of "him$_i$" in (20) must be met in this counterfactual world.

In short, like IPA this account of 3sg pronouns captures generalization IGP. Unlike IPA, however, it avoids generating unwanted indexical presuppositions for bound pronouns.[11] We can now turn to the semantics of conditionals.

5.2 Semantics for conditionals

An alternative to Jackson's account of the anomaly of (13) and (15) (repeated below) is proposed by Weatherson (2001) and Nolan (2003) and is based on the following suggestions:

11 For a detailed exposition and defense of this account of 3sg pronouns, we refer the reader to Del Prete & Zucchi (2017).

- when using a subjunctive, the speaker evaluates the consequent in the closest world in which the antecedent is true;
- when using an indicative, the speaker evaluates the consequent in the closest world in which the antecedent is true, *by considering this world as actual*.

(13) ??If Oswald did not shoot Kennedy, things are different today from the way they actually are.

(15) ??If Warren Beatty becomes the next president, things will be different from the way they actually will be.

According to this view, the reason why (13) and (15) are anomalous is that the world referred to by "actually" is the closest world w in which the antecedent is true and it can't be that the way things are in w is different from the way things are in w. In the Kaplanian framework adopted here, the suggestion by Weatherson and Nolan amounts to regarding indicatives as *monsters*: they shift the context of utterance c to a context k relative to whose world and time the antecedent is true.

Let us first specify one more assumption concerning the context of utterance:

A8. *Body of knowledge as a contextual coordinate*
A context of utterance c specifies an information state – a *body of knowledge* c_ω – as one of its coordinates.

Whose body of knowledge does context provide? We assume that, normally, it's the speaker's, what the speaker knows in the context of utterance, but we leave open the possibility that someone else's or some other group's body of knowledge may be relevant.[12] We now propose the Monstrous Semantics for indicatives below, while keeping to a standard Stalnakerian analysis of subjunctives (the circumstance of evaluation is now enriched with the assignment parameter g^s, which however plays no role in the semantics of conditionals):

- *Monstrous Semantics (Indicatives)*

i. $[\![if_{ind}\ \varphi, \psi]\!]_{c,<g^s,w,t>}$ is defined only if $[\![\psi]\!]_{k,<k^s_g,k_w,k_t>}$ is defined, where k is the context, among those compatible with the information state c_ω, such that k_w is the world closest to w meeting this condition: $[\![\varphi]\!]_{k,<k^s_g,k_w,k_t>} = 1$.

12 Santorio (2012), which we'll discuss in section 6.1, assumes that the relevant body of knowledge to interpret epistemic conditionals is that of the speaker. However, (as Santorio himself recognizes) the view that what matters for the interpretation of epistemic constructions is the speaker's knowledge might prove a simplifying assumption, as Hacking (1967), DeRose (1991) MacFarlane 2011, Yalcin 2007, and others have pointed out. One possibility is that the semantics developed here for epistemic conditionals should be modified in such a way that these conditionals are not true or false simpliciter in a context, but true or false relative to a body of knowledge. We will not pursue this alternative here.

ii. If $[\![if_{ind}\ \varphi, \psi]\!]_{c,<g^s,w,t>}$ is defined, then $[\![if_{ind}\ \varphi, \psi]\!]_{c,<g^s,w,t>} = 1$ iff $[\![\psi]\!]_{k,<k^s_g,k_w,k_t>} = 1$, where k is the context, among those compatible with the information state c_ω, such that k_w is the world closest to w meeting this condition: $[\![\varphi]\!]_{k,<k^s_g,k_w,k_t>} = 1$.

- *Stalnakerian Semantics (Subjunctives)*

i. $[\![if_{subj}\ \varphi, \psi]\!]_{c,<g^s,w,t>}$ is defined only if $[\![\psi]\!]_{c,<g^s,w',t>}$ is defined, where w' is the world closest to w such that $[\![\varphi]\!]_{c,<g^s,w',t>} = 1$.

ii. If $[\![if_{subj}\ \varphi, \psi]\!]_{c,<g^s,w,t>}$ is defined, then $[\![if_{subj}\ \varphi, \psi]\!]_{c,<g^s,w,t>} = 1$ iff $[\![\psi]\!]_{c,<g^s,w',t>} = 1$, where w' is the world closest to w such that $[\![\varphi]\!]_{c,<g^s,w',t>} = 1$.

Given the definition of truth in context in A7, Monstrous Semantics amounts to requiring that $\ulcorner if_{ind}\ \varphi, \psi \urcorner$ is true in a context c if and only if ψ is true in k, where k is the context, among those compatible with the information state c_ω, meeting this condition: k_w is the world closest to c_w such that φ is true in k.

Assuming that "actually" anchors the circumstance of evaluation of the clause in its scope to the world of the context, as in (22) below,[13] Jackson's contrasts from section 3 are now correctly predicted. We show this for the pair (12)-(13), repeated here:

(22) $[\![\text{actually } \varphi]\!]_{c,<g^s,w,t>} = 1$ iff $[\![\varphi]\!]_{c,<g^s,c_w,t>} = 1$

(12) If Oswald had not shot Kennedy, things would be different today from the way they actually are.

(13) ??If Oswald did not shoot Kennedy, things are different today from the way they actually are.

13 This assumption is disputed by Mackay (2017). Mackay observes that the same contrast between subjunctives and indicatives obtains if we drop "actually" from (12) and (13), as shown in (i)-(ii):

(i) If Oswald had not shot Kennedy, things would be different today from the way they are.

(ii) ??If Oswald did not shoot Kennedy, things are different today from the way they are.

Based on this and other observations, Mackay argues that it is not "actually" that anchors the circumstance to the world of the context. In Mackay's proposal, "actually" is a presuppositional operator, similar to "even" and "too", signalling that the normal evolution of context is being disrupted. (More precisely: "actually" presupposes that there is "a live body of knowledge from which the local context for the clause in the scope of 'actually' is not obtained simply by adding information from what was uttered").

If Mackay is right, the account of Jackson's contrast should not be based on clause (22). Wehmeier (2004) suggests that indicative mood is responsible for anchoring the sentence in its scope to the actual circumstances. In our system, this amounts to regarding indicative mood *as a Kaplanian actuality operator*. Once this assumption is made, our semantics of indicative and subjunctive conditionals predicts both the contrast between (12) and (13) and the contrast between (i) and (ii).

We predict truth-conditions (23) for counterfactual (12) and truth-conditions (24) for indicative (13):

(23) $[\![(12)]\!]_{c,<c_g^s,c_w,c_t>} = 1$ iff the way things are today in w' is different from the way things are today in c_w, where w' is the world closest to c_w such that Oswald has not shot Kennedy in w'.

(24) $[\![(13)]\!]_{c,<c_g^s,c_w,c_t>} = 1$ iff it is true in k that the way things are today is different from the way things are today, where k is the context compatible with the speaker's knowledge such that k_w is the world closest to c_w in which Oswald did not shoot Kennedy.

For the indicative conditional in (13), but not for the counterfactual in (12), the world that "actually" refers to is the closest world at which the antecedent is true. This has the consequence of making (13) inconsistent.

The Monstrous Semantics we propose for indicatives is conceptually close to Santorio's (2012) semantics for epistemic conditionals. However, there are two points of difference with respect to Santorio's proposal. First, the technical implementation is different: in our proposal the monstrous character follows directly from the fact that indicative *if* requires that the clauses in its scope be evaluated at a context k which may be distinct from the context of utterance c, whereas Santorio's informational modals (which determine the semantics of epistemic conditionals) quantify over worlds and assignments. Second, the empirical scope of our analysis is not the same as Santorio's: our Monstrous Semantics applies to *all* indicative conditionals, whereas Santorio intends his analysis to be restricted to *a subclass* of indicative conditionals. We come back to this point in section 6.3.

Notice that, while in our account indicatives and subjunctives differ in their semantics, hypothetical syllogism, contraposition and strengthening of the antecedent are predicted to be invalid inference patterns for both types of conditional, and the reason why they are invalid is essentially the same. To illustrate the point, let us focus on strengthening of the antecedent:

(25) a. If φ, then ψ.
b. Therefore, if φ and ξ, then ψ.

The argument schema may lead from a true premise to an unacceptable conclusion both for indicative and for subjunctive conditionals, as (26)-(27) show:

(26) a. If you add a pinch of salt, it'll taste good.
b. Therefore, if you add a pinch of salt and you add a pound of sugar, it'll taste good.

(27) a. If you had added a pinch of salt, it would have tasted good.

b. Therefore, if you had added a pinch of salt and you had added a pound of sugar, it would have tasted good.

Under Monstrous Semantics, argument (26) is predicted to be invalid. Let k be the context compatible with what the speaker knows in the context c in which (26) is uttered such that the world k_w is the world minimally different from c_w in which you add a pinch of salt. The world k_w need not be identical to the world k'_w minimally different from c_w in which you add a pinch of salt *and* you add a pound of sugar. Therefore, the fact that the consequent "it'll taste good" is true in k_w does not guarantee that it is true in k'_w. For the same reason, Stalnakerian Semantics predicts argument (27) to be invalid: the world w' minimally different from the world c_w in which you added a pinch of salt need not be identical to the world w'' minimally different from c_w in which you added a pinch of salt *and* you added a pound of sugar. In other words, under our account, strengthening of the antecedent turns out to be invalid both for indicative and subjunctive conditionals, since the antecedent world of the premise may not be identical to the antecedent world of the conclusion. By similar reasonings, contraposition and hypothetical syllogism are both predicted to be invalid.

Finally, before we turn to the interaction of our semantics for conditionals with our semantics of 3sg pronouns, we point out another desirable consequence of Monstrous Semantics. Adams (1970) has called attention to minimal pairs of the following kind:

(28) If Oswald hadn't shot Kennedy in Dallas, then someone else would have.

(29) If Oswald didn't shoot Kennedy in Dallas, then someone else did.

Clearly, (28) and (29) are not equivalent: while (29) is clearly true, one might dispute that (28) is true. This difference is expected under our analysis of conditionals. According to Monstrous Semantics, (29) is true as uttered in a context c if and only if "someone other than Oswald shot Kennedy in Dallas" is true in the context k, compatible with what the speaker knows in c, such that k_w is the world closest to c_w in which Oswald did not shoot Kennedy. Since it is common knowledge that Kennedy was shot, any context k, compatible with what someone uttering (29) knows, is such that it is true in k that Kennedy was shot. So, k_w is a world in which Kennedy was shot. Since in k_w Oswald did not do the shooting, someone else did, and (29) is correctly predicted to be true (in a context in which it is known that Kennedy was shot). On the other hand, by the Stalnakerian Semantics for subjunctives, (28) is true as uttered in a context c if and only if someone other than Oswald shot Kennedy in the world w' in which Oswald didn't shoot him which is closest to the utterance world. Since w' is not required to be a world in which what is known in the utterance context is true, one may dispute that w' is a world in which Kennedy gets shot. Thus,

the truth of (28), unlike that of (29), is correctly predicted to be dubious, although we know that Kennedy was shot in the real world.[14]

We now turn to how our Monstrous Semantics captures the facts about 3sg pronouns presented in section 1.

5.3 Gender in conditionals explained

The contrast between Yanovich's conditional (7) and Kaufmann's (9) is now expected (we repeat the relevant sentences below):

(7) If Sasha$_i$ is a girl, I'll buy her$_i$ a toy car.

(9) ??If John$_i$ undergoes an operation to become a woman, we'll buy her$_i$ a toy car.

Let's consider (7) first. By Monstrous Semantics, we get the following:

(30) $[\![(7)]\!]_{c,<g^s,w,t>} = 1$ iff $[\![$I'll buy her$_i$ a toy car$]\!]_{k,<k^s_g,k_w,k_t>} = 1$, where k is the context, among those compatible with the speaker's knowledge, such that k_w is the world closest to w meeting this condition:
$[\![$Sasha$_i$ is a girl$]\!]_{k,<k^s_g,k_w,k_t>} = 1$.

Since in the utterance context c Sasha's gender is not known, Sasha is a girl in some of the contexts compatible with the speaker's knowledge. Among these, let k be the context such that k_w is the world closest to w in which Sasha is a girl at k_t. By our analysis of 3sg pronouns in A6 and the way contextual assignment is specified by A7, the gender presupposition of "her$_i$" must be met at $<k_w, k_t>$, where $<k_w, k_t>$ is the world-time pair assigned to the pronoun's variable x_i by the modal component of the assignment k^s_g. Since Sasha is a girl at $<k_w, k_t>$, we correctly predict that (7) is felicitous.

Let's now turn to (9). This time, in the utterance context c John is known to be a man at the utterance time. Therefore, *any* context k compatible with the information state of c will be such that John is a man (hence, male) at $<k_w, k_t>$. As a consequence, the presupposition of "her$_i$" will not be met at the relevant world-time pair and we correctly predict that the utterance of (9) will turn out undefined.

We note in passing that if we turn future tense conditional (9) into a conditional with a past time antecedent, the result is acceptable:

14 In essence, this is how Adam's minimal pair may be accounted for if one assumes Stalnaker's (1975) analysis of indicative and subjunctive conditionals: the truth of (28) depends on the fact that it is common knowledge that Kennedy was shot in Dallas.

(31) If John$_i$ has undergone an operation to become a woman, we'll buy her$_i$ a toy car.

Our analysis can account for the contrast of acceptability between (9) and (31): a context c suitable for an utterance of (31) is such that John is no longer known to be a man at utterance time, which means that among the contexts k compatible with the information state of c, some are such that John is still a man at $<k_w, k_t>$ but, crucially, others are such that John is now a woman at $<k_w, k_t>$. By our Monstrous Semantics, the effect of (31) is precisely to select a context k of the latter type – i.e., a k such that John has already undergone the operation to become a woman at $<k_w, k_t>$. In a context of this type, the presupposition of "her$_i$" is met, and (31) is thus correctly predicted to be felicitous.

6 Further predictions

In this section we discuss some further predictions of our analysis. First we show how the Monstrous Semantics of indicatives deals with Santorio's (2012) cases of indexical shift involving the pronoun "I". Then we discuss some data involving temporal indexicals.

6.1 Epistemic shift

Santorio (2012: p. 363) describes the following case, under the heading of "epistemic shift" (the numbering of the examples is ours):

> Rudolf Lingens and Gustav Lauben are kidnapped. Lingens and Lauben are amnesiacs: each of them knows that he is one of the two kidnapped amnesiacs, but doesn't know which. They will be subjected to the following experiment. First, they will be anesthetized, then a coin will be tossed. If the outcome is tails, Lingens will be released in Main Library, Stanford, and Lauben will be killed. If the outcome is heads, Lauben will be released in Widener Library, Harvard, and Lingens will be killed. Lingens and Lauben are informed of the plan and the experiment is executed. Later, one of them wakes up in a library. He says:
>
> (32) If the coin landed tails, I am in Main Library, Stanford.
>
> (33) If the coin landed heads, I am in Widener Library, Harvard.

Santorio shows that, under the standard semantics in (34) below for the 1sg pronoun "I" (by which "I" rigidly denotes the speaker of the utterance context) and the intensional account for indicative epistemic conditionals in (35), one predicts that a joint utterance of (32) and (33) should sound contradictory, contrary to intuitions.

(34) $[\![\text{I}]\!]_{c,g,<w,t>} = c_a$

(35) $[\![if\ \varphi, \psi]\!]_{c,g,<w,t>} = 1$ iff $[\![\psi]\!]_{c,g,<w',t>} = 1$, for all worlds w' compatible with what the speaker of c knows at $<w,t>$ and such that $[\![\varphi]\!]_{c,g,<w',t>} = 1$

Indeed, supposing that Lingens is the speaker in c, the truth-conditions predicted for an utterance of (33) in c are the following:

(36) $[\![(33)]\!]_{c,g,<c_w,c_t>} = 1$ iff $[\![\text{I am in Widener Library, Harvard}]\!]_{c,g,<w',c_t>} = 1$, for all worlds w' compatible with what Lingens knows at $<c_w, c_t>$ and such that $[\![\text{the coin landed heads}]\!]_{c,g,<w',c_t>} = 1$
iff Lingens is in Widener Library, Harvard, in w' at c_t, for all worlds w' compatible with what Lingens knows at $<c_w, c_t>$ and such that the coin lands heads in w' at a time in the past of c_t.

The problem is that, among the worlds compatible with what Lingens knows in which the coin landed heads, there is none in which Lingens is in Widener Library at the time of utterance–in all such worlds, Lingens is dead at that time. So, if Lingens is the speaker, (33) should be false. On the other hand, by a parallel reasoning, if Lingens is the speaker, (32) should be true, since in every world compatible with what Lingens knows in which the coin landed tails Lingens is in Main Library at the time of utterance. By a similar reasoning, it is also easy to see that, by (34)-(35), sentence (33) is predicted to be true and (32) to be false. if Lauben is the speaker. Thus, a joint utterance of (32) and (33) should sound contradictory, no matter whether the speaker is Lingens or Lauben. But this is clearly not so.

Santorio's intuitive diagnosis concerning (32)-(33) is that "*I* picks out not the actual speaker but whatever individual is speaking in the circumstances singled out by the antecedent. In short, the referent of *I* seems to shift on the basis of the antecedent of the conditional" (Santorio 2012: p. 365). His technical solution to the problem is based on the following assumptions:

S1. Indexical pronouns are variables which, in (32)-(33), are bound by a (silent) epistemic necessity operator.

S2. The epistemic necessity operator shifts the assignment of the context by quantifying over world-assignment pairs $<g, w>$ such that:

(a) w is an epistemic alternative for the speaker that makes the antecedent of the conditional true;

(b) g assigns to each indexical pronoun α an individual which, as far as the speaker knows, is the counterpart in w of the individual assigned to α by the assignment of the context.

Assumption S2 amounts for Santorio to assuming that indicative epistemic conditionals are monsters, since they shift a context parameter that is responsible for the assignment of a denotation to indexicals. Given S1-S2, Santorio predicts that "I" refers to Lingens in (32) and to Lauben in (33), no matter whether it is Lingens or Lauben who utters the conditionals, thus accounting for the intuition that a joint utterance of (32) and (33) by the amnesiac who wakes up (whether he is Lingens or Lauben) is true in the described scenario.

Our account, like Santorio's, correctly predicts that (32)-(33) should both be true if uttered by any of the two amnesiacs in the same scenario. Indeed, suppose that Lauben utters (32) in c. The contexts compatible with what Lauben knows at $<c_w, c_t>$ are either contexts in which the coin landed heads, the speaker is Lauben and he is in Widener Library, or contexts in which the coin landed tails, the speaker is Lingens and he is in Main Library. However, the context k compatible with what Lauben knows at $<c_w, c_t>$ such that k_w is the world closest to the utterance world c_w in which the coin landed tails is a context in which the speaker is Lingens and he is in Main Library in k_w at k_t. Thus, (32) is true. Suppose now that Lauben utters (33) in c. The context k compatible with what Lauben knows at $<c_w, c_t>$, where k_w is the world closest to the utterance world c_w in which the coin landed heads, is now a context in which the speaker is Lauben and he is in Widener library. Thus, (33) is true. By a parallel reasoning, it is easy to see that (32)-(33) can both be asserted truly by Lingens. Thus, we predict that (32)-(33) should both be true if uttered by anyone of the two amnesiacs.

6.2 Lack of first person shift in subjunctives

Santorio (2012: p. 364) points out that subjunctives behave differently with respect to the possibility of shifting a first person pronoun. Suppose that one of the amnesiacs, after waking up, is trying to sum things up about how possible outcomes of coin tossing would have determined which library he is in. In this context, as Santorio points out, both (37) and (38) sound odd:

(37) Suppose the coin landed heads. If the coin had landed tails, I would have been in Main Library, Stanford.

(38) Suppose the coin landed tails. If the coin had landed heads, I would have been in Widener Library, Harvard.

This fact is expected if subjunctives are not monstrous, as both Santorio and we assume. Indeed, suppose one of the amnesiacs utters (37). Since he is supposing that the coin landed heads, he is supposing that he is Lauben. Under this supposition, it makes no sense for him to go on asserting the subjunctive in (37). Indeed, given that he is a competent speaker and knows that subjunctives are not monstrous (they have the truth-conditions in Stalnakerian Semantics), he knows that, under the supposition that he is Lauben, conditional (37) would express the false proposition that if the coin had landed tails, Lauben would have been in Main Library, Stanford. By a similar reasoning, we can show that it would make no sense for anyone of the amnesiacs to assert (38).

6.3 Lack of first person shift in future tense conditionals

Santorio (2012: p. 369) points out the following case (the numbering of the examples is ours):

> Suppose that, after having been informed about the experiment but before undergoing it, one of the amnesiacs says:
>
> (39) If the coin lands tails, I will be in Main Library, Stanford.
>
> (40) If the coin lands heads, I will be in Widener Library, Harvard.
>
> . . . (39)-(40) are not good utterances in the scenario. Intuitively, (39) sounds true only if the speaker is Lingens, (40) only if the speaker is Lauben. Since the speaker is uncertain of his identity, neither of them is felicitous (given the Gricean requirement that speakers should not assert what they don't have evidence for).

In the same passage, he remarks that "it is standard in formal semantics to assume that at least some indicative conditionals involving *will* express the same kind of modality that is expressed by counterfactuals." Santorio assumes that "will" in (39)-(40) is a modal operator, taking antecedent and consequent as arguments, which is unable to bind indexicals in its scope (unlike the silent epistemic necessity operator in (32)-(33)). This property of "will" allows him to predict that (39) is only true if uttered by Lingens and (40) is only true if uttered by Lauben. Since the amnesiac does not know whether he is Lingens or Lauben, it follows that he is not in a position to assert either (39) or (40).

If Santorio is right, it seems that one should distinguish different kinds of indicatives and restrict a monstrous account to indicatives that are not in the scope of "will." In fact, not only does our Monstrous Semantics for (all) indicatives correctly predict the facts Santorio observes concerning (39)-(40), but it is arguably empirically more adequate than Santorio's.

In order to show this, let's first introduce an assumption concerning (39)-(40). A grammatical property of these conditionals is that future tense only surfaces in their consequents, while their antecedents appear to be in the present tense. Semantically, however, the antecedents are also in the future tense, since they convey suppositions concerning the coin's landing at a future time. We will refer to conditionals of this kind (in which both antecedent and consequent are understood as being in the future tense) as *future tense conditionals*. We'll assume that, at LF, both antecedent and consequent of future tense conditionals are inflected for future tense.[15]

Now, in section 5.3 we showed how our Monstrous Semantics can successfully account for the anomaly of Kaufmann's conditional (9) (repeated here).

(9) ??If John$_i$ undergoes an operation to become a woman, we'll buy her$_i$ a toy car.

Conditional (9) is also a future tense conditional – its antecedent is understood as making a supposition about a future event of John's undergoing a sex change operation. Recall that the observed divergent behaviour of (9) with respect to Yanovich's indicatives (6)-(7) was predicted by our Monstrous Semantics in virtue of the fact that this semantics takes the temporal aspects into account, more precisely because it assumes that the relevant context for evaluating indicative conditionals is one which is compatible with what the speaker knows *at the time of utterance*. Here we submit that Santorio's conditionals (39)-(40) can be treated in a parallel way to (9): once we take the temporal aspect into account, their divergent behaviour with respect to (32)-(33) is explained away without giving up the monstrous account.

We show this by focusing on (39). According to our proposal, the truth-conditions of (39) (whose LF is (41)) are specified in (42):

(41) If FUT the coin lands tails, FUT I am in Main Library.

(42) $[\![(41)]\!]_{c,<g^s,c_w,c_t>} = 1$ iff $[\![\text{FUT I am in Main Library, Stanford}]\!]_{k,<k^s_g,k_w,k_t>} = 1$, where k is the context, among those compatible with what the speaker

15 Notice that languages like Italian and French are semantically more transparent in this respect, in that, typically, the antecedent of a future tense conditional is grammatically in the future tense in these languages. For instance, the French translation of (39) in (i) is overtly inflected for future tense:

(i) Si la pièce tombera sur pile, je serai dans la Main Library à Stanford.

of c knows at c_w, c_t, such that k_w is the world closest to c_w meeting this condition: $[\![\text{FUT the coin lands tails}]\!]_{k,<k_g^s,k_w,k_t>} = 1$.

Notice that, at the world and time of the utterance $<c_w, c_t>$, the speaker (whether he is Lauben or Lingens) is uncertain of his identity and does not know whether he'll survive the experiment. So, among the contexts compatible with the speaker's information state at the world and time of the utterance, there are both contexts of type (a) and contexts of type (b):

(a) contexts k in which Lauben is the speaker, the coin lands tails at a time in the future of k_t, and Lingens is in Main Library at (or shortly after) that future time;

(b) contexts k in which Lingens is the speaker, the coin lands tails at a time in the future of k_t, and Lingens is in Main Library at (or shortly after) that future time.

Now, suppose that the context k compatible with what the speaker knows at $<c_w, c_t>$ and such that k_w is the world closest to c_w in which the antecedent of (41) is true in k_w at k_t is a context of type (a), namely, the speaker of k is Lauben, the coin lands tails in k_w at some time later than k_t and Lingens is in Main Library in k_w at (or shortly after) that time. In this case, the consequent of (41) is false in k, for the following reason: by (34), the truth of the consequent of (41) in k would require that *Lauben* be in Main Library in k_w at a time later than k_t, while, in fact, it is *Lingens* who is in Main Library in k_w at a time later than k_t. So, if k is a context of type (a), the conditional is false in the context of utterance of c. Of course, if k were a context of type (b), and so the speaker of k were Lingens, conditional (39) would be true. However, since the speaker of (39) is uncertain of his identity, he does not know whether k is a context of type (a) or of type (b). Thus, the speaker of (39) (whether he is Lauben or Lingens) has no ground for asserting (39). By a similar reasoning, we can conclude that the speaker of (40) (whether he is Lauben or Lingens) has no ground for asserting (40). This is why (39) and (40) are anomalous.

We want to stress here that not only is a uniform monstrous analysis of indicatives compatible with (39)-(40), but there are also empirical reasons to avoid Santorio's conclusion that future tense indicatives are not monstrous. Consider Weatherson's contrast again:

(14) If Warren Beatty were to become the next president, things would be different from the way they actually will be.

(15) ??If Warren Beatty becomes the next president, things will be different from the way they actually will be.

Sentence (15) is a future tense conditional (the supposition of its antecedent concerns a future time). Yet, (15) contrasts with the counterfactual conditional in (14) exactly in the way we expect if (15), unlike (14), has the monstrous semantics we suggest.

Other cases supporting a uniform monstrous semantics for all indicatives are future tense conditionals (43) (inspired by Williamson 2006) and (44):[16]

(43) If Bernie becomes president, Bernie will actually become president.

(44) [Context: Maria is planning to have a baby though she is not pregnant yet. She gives the baby a name: "I call 'Alex' the first baby I'll have". Since, as a matter of fact, she *will* have a baby, the referent of the name is fixed. Musing on the clothes she will buy for Alex, she says:]
If Alex is male, we'll buy him red rompers. But if Alex is female, we'll buy her blue rompers.

Conditional (43) has a tautological flavor, but this is unexpected if it is non monstrous. Conditional (44), as Yanovich's conditionals (6)-(7), is a perfectly natural thing to say, and this is accounted for by our Monstrous Semantics.[17]

Finally, Santorio fails to notice that the minimal variants of (39)-(40) given in (45)-(48) below display indexical shift as clearly as his epistemic conditionals (32)-(33), although they are all future tense conditionals:

(45) If the coin lands tails and I wake up in Main Library, it will turn out that I am Lingens.

(46) If the coin lands heads and I wake up in Widener Library, it will turn out that I am Lauben.

(47) If the coin lands tails and I am Lingens, I will wake up in Main Library.

(48) If the coin lands heads and I am Lauben, I will wake up in Widener Library.

We conclude that a semantics that treats all indicatives, including future tense conditionals, as monstrous is preferable on empirical grounds to one that treats indicative future tense conditionals as non-monstrous.

16 Notice that both the antecedents and the consequents of (43)-(44) are about future events, thus they qualify as future tense conditionals.

17 In Italian the argument based on (44) would be semantically more transparent:

(i) Se Alex sarà maschio, gli compreremo una tutina rossa. Ma se Alex sarà femmina gli compreremo una tutina blu.
'If Alex is$_{fut}$ male, we'll buy him red rompers. But if Alex is$_{fut}$ female, we'll buy her blue rompers.'

Here the antecedent must be in the future tense overtly.

6.4 Temporal indexicals

As pointed out by Santorio, the phenomenon of "epistemic shift" generalizes to temporal indexicals. He considers the following conditionals, uttered in a context in which the speaker fell asleep at noon and wakes up without knowing whether he slept one or two hours (Santorio 2012: p. 369):

(49) If I slept one hour, it is now one.

(50) If I slept two hours, it is now two.

Both conditionals are felicitous and true in the described context. However, as Santorio points out, given the standard analysis of *now* in (51) below, conditionals (49)-(50) raise a problem for the intensional analysis in (35) that is exactly parallel to the problem that (32)-(33) raise for it.

(51) $[\![\text{now}]\!]_{c,g,<w,t>} = c_t$

Indeed, suppose that the speaker, call him "Bill", slept two hours and utters (49). In this case, the truth-conditions predicted for (49) under analysis (35) are the following:

(52) $[\![(49)]\!]_{c,g,<c_w,c_t>} = 1$ iff $[\![\text{It is now one}]\!]_{c,g,<w',c_t>} = 1$, for all worlds w' compatible with what Bill knows at $<c_w, c_t>$ such that $[\![\text{I slept one hour}]\!]_{c,g,<w',c_t>} = 1$
iff c_t = 1PM in w', for all worlds w' compatible with what Bill knows at $<c_w, c_t>$ such that Bill slept one hour in w' at c_t.

But (52) is not intuitively correct: there is no world compatible with what Bill knows in which Bill slept one hour and in which the actual time of utterance is the same as 1PM – in all worlds compatible with what Bill knows in which Bill slept one hour, the actual time of utterance is 2PM (despite the fact that Bill slept one hour in those worlds!). So, (52) incorrectly predicts that (49) is false if Bill slept two hours.

Our account makes correct predictions concerning (49)-(50), as we now show. Suppose c is a context in which Bill utters (49) after two hours of sleep, namely at 2PM. Since Bill knows that he fell asleep at noon, the context k compatible with what Bill knows at $<c_w, c_t>$, where k_w is the world closest to the utterance world c_w in which Bill slept one hour, is a context whose time is exactly one hour later than noon. Thus, (49) is true in c, since k_t = 1PM. Suppose now that c is a context in which Bill utters (50) after two hours of sleep: this time, the context k compatible with what Bill knows at $<c_w, c_t>$, where k_w is the world closest to the utterance world c_w in which Bill slept two hours, is a context whose time is exactly two hours later than noon. Thus, (50) is true in c, since k_t = 2PM. Thus, our semantics correctly predicts that (49)-(50) are both true if uttered in a context in which the time of

utterance is 2PM. It is easy to see, by a parallel reasoning, that (49)-(50) are both predicted to be true if uttered in a context whose time is 1PM.

7 Conclusions

The data presented here show that the gender presuppositions of 3sg pronouns display a complex behaviour: they project globally (i.e., behave indexically) when the pronouns occur free or are construed with proper names in some environments (belief reports, counterfactuals), but they project locally when the pronouns are bound by quantifiers under a modal or are construed with proper names in indicative conditional environments (except for future tense conditionals). Since we take that it is a desirable goal to provide a uniform semantics for 3sg pronouns,[18] the task of accounting for this complex presuppositional behaviour becomes even more challenging. Our claim here is that a variablist account of 3sg pronouns paired with a monstrous semantics for indicative conditionals (and a standard semantics for subjunctives) achieves the goal of accounting for this complex behaviour compatibly with a uniform treatment of 3sg pronouns. Our semantics for indicative conditionals is independently needed to deal with previously described data involving *actually* and for the cases of "epistemic shift" with the indexicals *I* and *now* described by Santorio (2012). As it should be clear from our discussion, the semantics we propose for indicative conditionals builds on Santorio's proposal. We have argued that, apart from technical differences, our version provides an empirically more adequate account of the facts.

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18 This is not to say that non-uniform accounts of the semantics of 3sg pronouns have not been proposed and defended. For a recent account which treats bound pronouns differently from free pronouns, see Kratzer (2009). See Del Prete & Zucchi (2017) for a discussion of Kratzer's proposal.

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