

## RESEARCH

Resumption as a sluicing source in Saudi Arabic:  
Evidence from sluicing with prepositional phrasesYara Alshaalan<sup>1,2</sup> and Klaus Abels<sup>1</sup><sup>1</sup> UCL Department of Linguistics, London, GB<sup>2</sup> KSU, SA

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This paper reports the results of three acceptability judgment experiments on Saudi Arabic elliptical questions (sluicing) with prepositional phrases. We show that in standard cases of merger type sluicing and contrastive sluicing there is no penalty for leaving out the preposition. Under an analysis of sluicing with syntactic identity between antecedent and ellipsis site, such examples require preposition stranding in the ellipsis site. We call this pattern OPUS, which the reader is invited to interpret as an abbreviation, depending on their theoretical predilections, as *O*stensible *P*-stranding *U*nder *S*luicing or as *O*mission of *P*reposition *U*nder *S*luicing. Our findings show that Saudi Arabic violates Merchant's (2001) second form identity generalization. Further experiments reveal that the status of the examples depends on the status of the most acceptable synonymous source within the ellipsis site; in particular, when neither a cleft structure nor a resumptive structure are grammatically available in the ellipsis site, the acceptability of OPUS decays. We interpret this as evidence that there is syntactic structure at the ellipsis site and that the *wh*-remnant in these elliptical questions can – and sometimes must – relate to a resumptive pronoun in the ellipsis site.

**Keywords:** Ellipsis; Sluicing; P-Stranding; Resumption; Arabic

## 1 Introduction

Using data on Sluicing in Saudi Arabic, this paper is a contribution to the debate on the syntactic analysis of ellipsis. On the basis of three acceptability judgment experiments on Saudi Arabic elliptical questions with prepositional phrases we argue that there is syntactic structure at the ellipsis site and that the *wh*-remnant in these elliptical questions can – and sometimes must – relate to a resumptive pronoun in the ellipsis site. The argument rests on the observation that the acceptability of elliptical questions depends on the availability of a corresponding full question.

The formation of elliptical questions in which only the *wh*-phrase is pronounced is referred to as sluicing (Ross 1969). Typical examples are given in (1).

- (1) a. John bought a car, but I don't know which one [ ]  
 b. John bought a car, but I don't know what else [ ]
- 

In example (1a) the embedded question is understood to mean *which car John bought*, although what is pronounced is *which one*. We will refer to the pronounced material in the

question as the remnant. The sluice itself is arguably a clausal constituent and thus different from the remnant (Levin 1982; Ginzburg and Sag 2000; Merchant 2001; Culicover and Jackendoff 2005); unlike the remnant, the sluice is a clause. Under some theories, the sluice is made up of a remnant and an ellipsis site. The content of the sluice is recovered via a contextually given antecedent. In a canonical example like (1a) the remnant corresponds to an indefinite in the antecedent: the correlate<sup>1</sup> (Chung, Ladusaw & McCloskey's (1995) 'inner antecedent'). Chung et al. (1995) coined the term 'merger type sluicing' for examples like (1a), in which there is an overt indefinite correlate in the antecedent and the sluice questions its identity. When the sluice questions the identity of a different entity, we speak (following Merchant (2001)) of contrast sluicing. Example (1b) with *what else* as the remnant is an instance of contrast sluicing.

Following Dayal & Schwarzschild (2010), we refer to the full clausal structure hypothesized to fill the ellipsis site under some theories as the pre-sluice. In (1a) there are two plausible pre-sluices: *which one he bought* and *which one it is*.

Despite intense research, no consensus has been reached about whether the understood material is syntactically represented at the ellipsis site (Ross 1969; Lakoff 1970; Baker & Brame 1972; Chomsky 1972b; Chung et al. 1995; Merchant 2001; Lasnik 2005; Fukaya 2007; Van Craenenbroeck 2010a; 2010b; Müller 2011; Fukaya 2012; Barros 2014; Barros et al. 2014; Griffiths & Lipták 2014; Abe 2015; Abels 2017a) or not (Erteschik-Shir 1973; Levin 1982; Dalrymple et al. 1991; Ginzburg & Sag 2000; Culicover & Jackendoff 2005; Sag & Nykiel 2011; Barker 2013). That is, it is unclear whether the ellipsis site is occupied by a syntactically represented pre-sluice whose structure varies in some way with the antecedent clause.

The debate persists, because the evidence that bears on the structure of the ellipsis site is necessarily indirect and appears to point to different conclusions: Ross's (1969) famous observation that sluicing repairs island violations has been taken to indicate (Culicover & Jackendoff 2005) that there is no structure at the ellipsis site (although see Barros et al. 2014; Abels 2017c for a different assessment). On the other hand, the observation – also due to Ross (1969) – that the correlate and the remnant match in morphological case is often interpreted as evidence not just for the presence of syntactic structure at the ellipsis site but for the presence of structure syntactically isomorphic to the antecedent (Ross 1969; Lasnik 2005 but see Ginzburg & Sag 2000; Culicover & Jackendoff 2005; and for discussion of more complex cases see Kim 2015; Vicente 2015; Wood, Barros, and Sigurðsson 2016; Abels 2017c; Kidwai 2018). Finally, Ross (1969) suggested that sluicing is derived by *wh*-movement in the ellipsis site. The basis of this claim is that sluicing obeys constraints on pied-piping in corresponding full questions. However, different authors have idealized the relevant facts in a number of ways and come to diverging conclusions.

The current paper picks up the theme of pied-piping. We set island amelioration and case matching between correlate and remnant aside. The issue of case matching is moot since Saudi Arabic has no morphological case distinctions. Islands are ameliorated under sluicing in Saudi Arabic, but the examples we are aware of do not allow us to choose between different theories of island amelioration.

<sup>1</sup> Our use of the term 'correlate' differs from the way the term is used in Ginzburg & Sag (2000) and Nykiel (2015). As we understand it, in those works the term correlate picks out the PP in the antecedent in both (i) and (ii) We will say that in (i) the correlate is the PP *on something* but that in (ii), the correlate is not the PP but the DP *something*.

- (i) John was lying on something, but I don't remember on what.
- (ii) John was lying on something, but I don't remember what.

As we alluded to above, Ross (1969) proposes a theory of sluicing according to which the ellipsis site contains syntactic structure identical to the antecedent and the remnant is extracted by regular *wh*-movement. This approach predicts Merchant's (2001) second form identity generalization: 'language L will allow preposition stranding, under sluicing iff L allows preposition stranding under regular *wh*-movement' (Merchant 2001: 92). This is so because, under Ross's account, constraints on pied-piping, and in particular pied-piping of prepositions, are enforced under sluicing (Abels 2019). A theory of sluicing without structure at the ellipsis site makes no such prediction (Sag & Nykiel 2011; Nykiel 2013; Kim 2015): whether the preposition appears or does not appear in the sluice is independent of syntactic constraints on pied-piping and determined by other factors. Merchant (2001) claimed that the prediction of the Ross-style theory is correct. Recognizing the importance of the issue, a lot of literature since has probed the truth of this generalization, and produced an impressive number of counterexamples to the generalization (Szczegielniak 2006; Vicente 2006; Almeida & Yoshida 2007; Fortin 2007; Stjepanović 2008; Szczegielniak 2008; Rodrigues et al. 2009; Sato 2010; Van Craenenbroeck 2010a; Sato 2011; Wei 2011; Algryani 2012; Stjepanović 2012; Vlachos 2012; Nykiel 2013; Adliene 2014; Philippova 2014; Leung 2014a; 2014b; Albukhari 2016; Alshaalan 2017; Abels 2017a; Stigliano 2018; Molimpakis 2019).

For ease of reference, we will refer to examples of sluicing where the remnant is a DP and the correlate DP is the complement of a preposition as OPUS, which the reader is invited to interpret as an abbreviation, depending on their theoretical predilections, as *Ostensible P-stranding Under Sluicing* or as *Omission of Preposition Under Sluicing*. OPUS is the name of a phenomenon in search of an analysis. There have been two predominant reactions to the existence of OPUS. Some researchers have analysed the phenomenon in terms of *wh*-movement in the ellipsis site but with pre-sluices that are semantically but not necessarily syntactically identical to the antecedent (Rodrigues et al. 2009; Van Craenenbroeck 2010a; 2010b; Algryani 2012; Barros 2014; Barros et al. 2014; Leung 2014b; Albukhari 2016; Abels 2017a). Others have taken OPUS to demonstrate the absence of structure at the ellipsis site (for fragment answers see Culicover and Jackendoff 2005; and for analyses on sluicing see Sag & Nykiel 2011; Barker 2013; Nykiel 2013). The two types of theory differ in their predictions. A theory that allows paraphrases of the antecedent as pre-sluices predicts that OPUS will not be acceptable unless there is a suitable paraphrase; a theory without structure at the ellipsis site doesn't predict that the availability of a paraphrase should affect the judgments. The discussion in this paper addresses the predictions of both types of theory.

The logic of the experiments and the main thrust of the argumentation employed here is different from many previous experimental and psycholinguistics studies on ellipsis. These studies have dealt with structures for which there is a well-formed candidate structure that can potentially fill the ellipsis site but which differs from the antecedent in various ways. The studies have then measured how the structural distance between the overt antecedent and the hypothesized pre-elliptical structure affects a variety of variables. The literature reviewed in Frazier (2018) under the heading 'Empirical evidence for syntactic structure at the ellipsis site' is typical in this regard.<sup>2</sup> Our own experiments do not try to measure the effect of structural distance between antecedent and hypothesized elided structure. Instead we attempt to demonstrate that there must be some structure in the ellipsis site (isomorphic or not) by showing that if no candidate structure exists, there is an acceptability penalty.

<sup>2</sup> Even Cai et al. (2012), who ultimately reject the hypothesis that there is structure in the VP-ellipsis site in Mandarin, rely heavily on the assumption that if there were structure at the ellipsis site, it would have to be isomorphic to the antecedent. This assumption is challenged here.

One language that challenges the idea of isomorphic pre-sluices and antecedents is Polish. Nykiel (2013) showed that examples of OPUS are significantly more acceptable than P-stranding in non-elliptical structures. However, examples of OPUS are also less acceptable than pied piping under sluicing. She further shows (contra to Szczegieliński 2008) that *wh*-clefts cannot be the source for these P-less sluices. She claims that complexity of the *wh*-remnant and that of the correlate affect the acceptability of P-less sluices.<sup>3</sup>

Molimpakis's (2019) work on Greek presents broadly similar results (see Table 1). In Molimpakis's (2019) experiments there are no well-formed candidate pre-sluices for examples of OPUS. The puzzling result of her study is that OPUS is less acceptable than pied-piping (both in elliptical and non-elliptical conditions) but at the same time much more acceptable than P-stranding in non-elliptical conditions (or any other plausible pre-sluice).<sup>4</sup>

Such results lead to an argumentative impasse. On the one hand, proponents of a structural approach can claim that these results support their theory, since there is a clear decrease in acceptability when the preposition is missing. On the other hand, proponents of a non-structural account can claim that the results support their theory, since there is a clear and very large increase in acceptability of P-less sluices over overt P-stranding.

The current set of experiments on Saudi Arabic aim to overcome this impasse by explicitly contrasting structures with and without well-formed pre-sluices. Experiment 3 in particular probes structures that differ in the availability of a fully acceptable pre-sluice. By contrasting examples of OPUS with *where* versus *when* as remnants, we demonstrate that the judgments are modulated by the existence or lack of a grammatical pre-sluice. The results thus suggest that there is structure at the ellipsis site.

The experiments also bear on the question of what factors, apart from the existence of a well-formed pre-sluice, might influence the acceptability of OPUS. We focus on Nykiel (2013; 2015; 2017) as the most explicit model of such effects.

Working within a non-structural approach to ellipsis resolution, Nykiel in a series of papers develops a model of the factors influencing the acceptability and prevalence of what she calls ellipsis alternation, that is, the alternation between PP and DP remnants of clausal ellipsis (sluicing's OPUS being but one case), where the correlate is a PP or the DP complement of a preposition, respectively. Given her non-structural approach to the ellipsis site, there is no a priori reason to expect the ability of a preposition to be absent under ellipsis to be correlated with its ability to be stranded under syntactic movement in any language (Nykiel 2012). In our view, considerations of learnability do indeed suggest that ellipsis resolution cannot be parameterized due to the lack of triggering evidence. Therefore,

**Table 1:** Mean acceptability ratings on a 7-point scale from Molimpakis's experiment.

	Elliptical	Non-elliptical
P-stranding	5.09	2.33
Pied-piping	6.35	6.27

<sup>3</sup> The difference between OPUS and P-stranding in non-elliptical sentences appears to be a very large effect (judging by the figures in Nykiel's paper). Despite their limited power, Nykiel's studies likely picked up a real effect here. For discussion of the effect of complexity that she found, see footnote 4.

<sup>4</sup> There were significant main effects of ellipsis and of P-stranding, and a highly significant interaction between the two in the experiment. Interestingly, Molimpakis (2019) did not find an effect of complexity of the *wh*-phrase. Half of the stimuli in the experiment involved simplex and half of them complex *wh*-phrases. Each of the 84 participants analysed for the results saw four examples of OPUS with simplex and four with complex *wh*-phrases. In Nykiel's (2013) study, where an effect of complexity was reported, each participant saw on average 1.5 examples of OPUS with simplex and 1.5 examples of OPUS with complex *wh*-phrases. With such a low number of stimuli, it is impossible to reliably detect a relatively small effect like that of *wh*-complexity (see Westfall et al. 2014).



cross-linguistic differences in the phenomenology of ellipsis resolution should either be absent or reduceable to independently known properties of the languages in question.

Nykiel (2014; 2015) develops a model of the propensity of the preposition to be absent under clausal ellipsis based on four factors, which she claims to have cross-linguistic validity.

The first factor is construction type. Nykiel's (2013; 2015) corpus work covers sluicing, bare argument ellipsis, reprise questions, and split questions. We will not consider this factor here, because we only use sluicing in our experiments and so the factor of construction type is held constant.

The second factor has to do with "the semantic and syntactic content of the *wh*-phrase serving as a remnant" (Nykiel 2017: 29). The idea is that less informative and structurally less complex remnants are dispreferred in examples of OPUS compared to more informative and structurally more complex remnants. Nykiel supports this claim based on qualitative comments in the syntactic literature, on her own (2013a) work on Polish (though see footnote 4 above for reasons to be skeptical), as well as corpus work on contemporary (Nykiel 2017) and previous stages of English (Nykiel 2015). It is difficult to judge the relevance of this factor for sluicing based on Nykiel's corpus data, since the effect of what we will call informativity is only reported for the entire corpus which is heavily skewed towards fragment answers. Examples of sluicing make up only about one in seven examples in Nykiel's (2015) historical corpora and, judging by the (2013) version of Nykiel (2017), there are only 9 examples of sluicing in total in the corpus work on contemporary English.

This second factor of informativity is manipulated in experiment 1, which used both bare indefinites and contentful DPs as correlates. In the experiment we did find a small effect of informativity but this effect failed to replicate in a second experiment, which we do not report here in full (but see footnote 18).

The third factor in Nykiel's (2013; 2015; 2017) model is structural persistence. This factor distinguishes B's utterance in (2), where the antecedent contains a PP but the elliptical utterance just contains a noun phrase (lack of persistence), from A's final utterance, where the immediate antecedent contains no preposition and the noun phrase is structurally persistent:

- (2) (Nykiel 2014: 15)  
 A: He's in the army?  
 B: Which one?  
 A: Ours.

The idea behind structural persistence is that the form chosen in the antecedent utterance conditions the form chosen for the elliptical utterance. A PP in the antecedent increases the likelihood of a PP as the remnant, while a DP in the antecedent increases the likelihood of a DP as the remnant. Moreover, on Nykiel's assumption that corpus frequency correlates positively with acceptability, persistent sluicing remnants should be more acceptable than non-persistent ones. Structural persistence is, in essence, a syntactic priming effect. It has been found in psycholinguistic work on ellipsis (Levelt & Kelter 1982) and plays a role in predicting corpus frequencies in historical and contemporary English (Nykiel 2015; 2017). We should point out that since Nykiel's corpora are heavily skewed towards fragment answers and since Levelt and Kelter's (1982) paper also deals with fragment answers, the relevance of structural persistence to sluicing has never been demonstrated. The factor of structural persistence is held constant in experiments 1 and 3 of the present paper, but it is manipulated in experiment 2, where we compare structures that obey persistence with structures that disobey persistence. Structural persistence predicts that structures that disobey persistence should be less acceptable than structures that obey persistence. We did not find the predicted effect.

The fourth and final factor has to do with the semantic dependency between the preposition and the verb. Nykiel employs two tests taken from Hawkins (1999) for semantic dependency between PP and verb. The verb is dependent on the preposition if a sentence with the PP does not entail the sentence without the PP. The verb is independent if the sentences with the PP does entail the one without the PP: *I counted on Peter* does not entail *I counted*, thus, *count* is dependent on the PP in the first sentence. On the other hand, *I read on Tuesday* entails *I read*. Thus, *read* is independent of the PP. Dependency of the PP on the verb (i.e., dependency in the other direction) is tested by checking whether the sentence with the verb and PP entails a sentence with the same PP and a generic predicate. For example, *I read on Tuesday* entails *Something happened on Tuesday* and thus the PP is independent of the verb. On the other hand, *I counted on Peter* does not entail *Something happened on Peter* or *I did something on Peter*, etc. The PP is therefore dependent on the verb. In Nykiel's (2015; 2017) corpus data, a dependency between verb and prepositions in either direction makes the preposition less likely to appear in the remnant. Employing again the idea that corpus frequency is positively correlated with acceptability, OPUS is predicted to be more acceptable when there is a dependency than when there is none. Experiments 1 and 2 largely used verbs and PPs that have a dependency; experiment 3 used verbs and PPs that – by Nykiel's own criteria – are independent of each other. Since in experiment 3 all factors that enter into Nykiel's model are held constant, the model would seem to predict a null result. The fact that we did find an effect thus demonstrates the insufficiency of the model.

The remainder of the paper is structured as follows. In section 2, we review what has been proposed about OPUS in other Arabic dialects and provide background on question formation in Saudi Arabic. In sections 3–5 we report the results of three experiments. The methods and design of these experiments are modelled closely on Molimpakis's (2019) study of OPUS in Greek. In section 3 we report the results of an experiment showing that OPUS is permissible in Saudi Arabic. To block the availability of a *wh*-cleft in the ellipsis site, which the previous literature had argued to be the source of OPUS in Arabic, we employ contrast sluices in the experiment. We conclude that under a structural approach to the ellipsis site, resumption must be available. The experiment reported in section 4 compares judgments on OPUS with judgments for canonical sluices with DP-remnants. All examples in the experiment have acceptable pre-sluices, although they are not necessarily isomorphic to the antecedent. We find that in this type of setup there is no degradation coming from the lack of a preposition in the remnant. Hence, what is interpreted under a structural approach as the construction of an alternative pre-sluice does not seem to come with a measurable degradation. Finally, experiment 3 in section 5 shows that sluices without a plausible paraphrase as the pre-sluice are less acceptable<sup>5</sup> than those with a suitable paraphrase that could serve as the pre-sluice. We interpret these results to show that there is syntactic structure at the ellipsis site. Various further conclusions and issues are discussed in the concluding section.

## 2 On sluicing and question formation in Saudi Arabic

OPUS has previously been noted for other Arabic dialects: Jordanian (Albukhari 2016), Emirati (Leung 2014a; 2014b), Libyan (Algryani 2012). Working within structural approaches to sluicing, these authors suggest that sluicing in Arabic can be derived from two (roughly) synonymous types of pre-sluices: *wh*-movement structures that are structurally identical to the antecedent and *wh*-clefts. As illustrated below, *wh*-clefts do not require preposition pied-piping. The above authors use this observation to suggest that OPUS in Arabic does not argue

<sup>5</sup> We briefly discuss the thorny issue of what the relation between acceptability and grammaticality is in the overall discussion.

against the existence of structure at the ellipsis site but only against the idea that the structure at the ellipsis site must be syntactically identical to the antecedent.<sup>6</sup> We should point out that while the data presented in the papers cited is compatible with a structural approach to sluicing, this approach is not forced, because the papers do not probe what happens when no well-formed pre-sluice is available. Furthermore, the authors consider only *wh*-clefts as an alternative pre-sluice, but we will demonstrate the relevance of resumptive pronouns in experiments 1 and 2 under a structural analysis.

In order to understand this criticism of the existing literature on Arabic and the experiments below, it is important to realize that Arabic, including Saudi Arabic, has three<sup>7</sup> clearly distinct, relevant strategies of *wh*-questions formation: *wh*-movement<sup>8</sup> (3a), *wh*-clefts (3b), and *wh*-resumption (3c). The *wh*-movement strategy is characterized by the fronting of a *wh*-phrase, the appearance of a gap in the question nucleus, and the absence of a relative complementizer or (pronominal) copula between the *wh*-phrase and the question nucleus. The *wh*-clefting strategy is characterized by the fronting of a *wh*-phrase, the optional presence of a pronominal copula, the obligatory presence of the relative complementizer (*aly*), and the presence of an obligatory overt resumptive pronoun in most syntactic positions except for the local subject position (see McCloskey 1990; Shlonsky 1992).<sup>9</sup> Finally, the resumptive strategy is characterized by the absence of the relative complementizer, the absence of a pronominal copula, and the presence of a resumptive pronoun.

- (3) a. ʾay bant šaft-ī \_\_\_?  
 which girl see-2FSG  
 ‘Which girl did you see?’
- b. ʾay bant (hay) aly šaft-ī-hā?  
 which girl she that see-2FSG-her  
 ‘Which girl is it that you saw?’
- c. ʾay bant (\*hay) šaft-ī-hā?  
 which girl she see-2FSG-her  
 ‘Which girl did you see her?’

These three strategies interact in different ways with contrastive *wh*-phrases, with preposition pied-piping, and with *wh*-type. Preposition pied-piping is always enforced with *wh*-movement (4a) but it is optional with *wh*-clefts (4b), and *wh*-resumption<sup>10</sup> (4c).

- (4) a. i. \*ʾay bant taklm [pp ma<sup>c</sup> t<sub>DP</sub>]?  
 which girl talked.3MSG to  
 ii. [pp ma<sup>c</sup> ʾay bant] taklm t<sub>pp</sub>?  
 to which girl talked.3MSG  
 ‘To which girl did he talk?’

<sup>6</sup> In our view, a *wh*-movement structure counts as syntactically identical to the antecedent but a *wh*-cleft does not, since the cleft has an extra layer of clausal structure.

<sup>7</sup> Arabic allows *wh*-in-situ as a fourth strategy. We believe that our results argue against an in-situ analysis of sluicing in Saudi Arabic. However, to keep exposition manageable, we will only return to the issue of an in-situ analysis in section 5.3.

<sup>8</sup> We use these labels as matter of convenience. We are aware of the fact that resumption pronouns have sometimes been analysed as residues of movement (Aoun et al. 2001; Boeckx 2001; Aoun and Li 2003). We are also aware that there is a long syntactic tradition treating filler-gap structures without literally invoking movement (Abels 2017b).

<sup>9</sup> An overt subject pronoun in the long distance condition may but need not be present.

<sup>10</sup> The acceptability of (4cii) surprised us somewhat but structures like it were accepted to a reasonable degree in the experiment discussed in footnote 18.

- b. i. ʔay bant hay aly taklm ma<sup>ʕ</sup>-hā?  
which girl she that talked.3MSG to-her  
‘Which girl was it that he talked to?’
- ii. ma<sup>ʕ</sup> ʔay bant hay aly taklm ma<sup>ʕ</sup>-hā?  
to which girl she that talked.3MSG to-her  
‘To which girl was it that he talked?’
- c. i. ʔay bant taklm ma<sup>ʕ</sup>-hā?  
which girl talked.3MSG to-her  
‘Which girl did he talk to her?’
- ii. ma<sup>ʕ</sup> ʔay bant taklm ma<sup>ʕ</sup>-hā?  
to which girl talked.3MSG to-her  
‘To which girl did he talk to her?’

Contrastive *wh*-phrases on the other hand, are possible with *wh*-movement (5a) and *wh*-resumption (5c) but not with *wh*-clefts<sup>11</sup> (5b). We agree with a reviewer, who suggests that the deviance of (5b) is likely owed to the exhaustivity of clefts.

- (5) Context: Mohammed saw more than one girl
- a. ʔay bant ba<sup>ʕ</sup>d Maḥmd šāf t<sub>DP</sub>?  
which girl else Mohammed saw.3MSG  
‘Which other girl did Mohammed see?’
- b. \*ʔay bant ba<sup>ʕ</sup>d hay aly maḥmd šāf-hā?  
which girl else she that Mohammed saw.3MSG-her
- c. ʔay bant ba<sup>ʕ</sup>d Maḥmd šāf-hā?  
which girl else Mohammed saw.3MSG-her  
‘Which other girl did Mohammed see her?’

Contrast interacts in the expected way with pied piping of prepositions: *wh*-movement requires pied-piping, *wh*-clefting is incompatible with contrast whether pied-piping occurs or not, and resumption is compatible with contrast and pied-piping. Relevant examples are given below in section 3, Table 4.

We should note that other kinds of contrast are compatible with the cleft strategy. The following context contrasting boys with girls does not distinguish the three strategies:

- (6) Context: Mohammed saw the boy with the long hair, but the speaker wants to know which girl Mohammed saw.
- a. ʔay bant Maḥmd šāf t<sub>DP</sub>?  
which girl Mohammed saw.3MSG  
‘Which girl did Mohammed see?’
- b. ʔay bant (hay) aly Maḥmd šāf-hā?  
which girl (she) that Mohammed saw.3MSG-her  
‘Which girl was it that Mohammed saw her?’
- c. ʔay bant Maḥmd šāf-hā?  
which girl Mohammed saw.3MSG-her  
‘Which girl did Mohammed see her?’

Since the aim of the experiments is to distinguish the three strategies from each other, we use examples like (5) and set examples like (6) aside as uninformative.

<sup>11</sup> The claim about (5) was confirmed using filler sentences in experiment 3.

Finally, *wh*-movement is compatible with all kinds of *wh*-phrases (nominal, d-linked, non-d-linked, and adverbial). *Wh*-clefts (7a–9a) and resumption (7b–9b) are somewhat restricted: they do not occur with true adjuncts *how* and *why* nor with *when*. Both do allow *where*, as we show immediately below.

- (7) a. \*kayf haw aly ṣalḥ as-sayāra?  
\*how it that fix.3MSG the-car?  
b. \*kayf ṣalḥ-h as-sayāra?  
\*how fixt.3MSG-it the-car?
- (8) a. \*layh haw aly ṭalʿ badrī?  
\*why it that left.3MSG early?  
b. \*layh ṭalʿ-h badrī?  
\*why left. 3MSG-it early?
- (9) a. \*matā haw aly waṣl?  
\*when it that Arrive.3MSG?  
b. \*matā waṣl-h?  
\*when arrive. 3MSG-it?

The literature on other Arabic dialects reports that *wh*-clefts are restricted to nominal *wh*-phrases only (Shlonsky 2002), but we do not find this restriction in Saudi Arabic. The literature on resumption (Aoun et al. 2010) also leads one to further expect non-d-linked phrases such as *what* or *where* to be excluded from the resumption strategy. However, this expectation is thwarted in Saudi Arabic. Examples (10) and (11) show that resumption and clefting are possible with *what* and with *where*. These judgments are corroborated in experiments 1 and 3, respectively. As expected, resumption of *which*-phrases and of *who* are unproblematic in Saudi Arabic. The situation is summarized in Table 2.

- (10) a. ayš (haw) aly Nawf ʿakl-t man-h?  
what (it) that Noaf eat-3FSG from-it?  
‘What was it that Noaf ate from?’  
b. ayš Nawf ʿakl-t man-h?  
what Noaf eat-3FSG from-it?  
‘What did Noaf eat from?’
- (11) a. wayn (haw) aly Raym rāḥ-t l-ah?  
where (it) that Reem went-3FSG to-it?  
‘Where was it that Reem went to?’  
b. wayn Raym rāḥ-t l-ah?  
where Reem went-3FSG to-it?  
‘Where did Reem go to?’

**Table 2:** Summary of *wh*-question strategies in Saudi Arabic.

	<i>wh</i> -movement	<i>wh</i> -cleft	<i>wh</i> -resumption
Pied-piping obligatory	Yes	No	No
Contrast possible	Yes	No	Yes
Restricted <i>wh</i> -phrases	No	Yes	Yes



Two themes in the literature on resumption are island (in-)sensitivity and reconstruction, and their interactions (see Aoun et al. 2010). In Saudi Arabic, the cleft and the resumptive strategy are both island insensitive while the *wh*-movement strategy is, expectedly, island sensitive. We have not systematically investigated the reconstructive properties of the three question types. Island (in-)sensitivity is not considered in this paper, because the target construction of our investigation, sluicing, is independently known to lack island effects (Ross 1969). Reconstruction effects of the type studied in Aoun et al. (2010) are very difficult to investigate experimentally. Our experimental aims here are much more modest.

We should note that a descriptive three-way distinction between *wh*-question types characterizes other Arabic dialects as well. Some researchers (e.g. Algryani 2012) suggest that the structures underlying what we call the cleft-strategy and what we call the resumptive-strategy are identical. Under this view the resumptive strategy – like the cleft strategy – is a bi-clausal copular structure with a null copula and a null relative complementizer. We do not follow this line of analysis, as it fails to explain the differences between the two strategies noted above and offers no explanation for why the relative complementizer should be null just in this particular kind of structure; Saudi Arabic does not usually allow null relative complementizers.

(12) al-bant \*(aly) al-wald šāf-hā rāh-t  
 the-girl \*(that) the-boy saw.3MSG-her left.3FSG  
 ‘The girl that the boy saw, left.’

(13) akl-t \*(aly) ṭabkt-ī-h  
 eat-1 \*(that) cooked-2FSG-it  
 ‘I ate what you cooked’.

We leave open the question of whether resumptive pronouns (outside of island contexts) can or must be the residue of movement.

### 3 Experiment 1: Are clefts the only non-isomorphic pre-sluice in Saudi Arabic?

In experiment 1 we investigated whether *wh*-clefts are the only possible non-isomorphic paraphrase in the ellipsis site as has been suggested by Algryani (2012); Leung (2014b); Albukhari (2016). As mentioned in section 2, some of the previous literature on Arabic dialects had observed the acceptability of OPUS under merger type sluicing and analysed it in terms of an elided *wh*-cleft.<sup>12</sup> Recall that in Saudi Arabic contrastive *wh*-phrases are possible with *wh*-movement and *wh*-resumption but not with *wh*-clefts (Table 2). We focused here on contrast sluices to block the availability of *wh*-clefts in the ellipsis site. If *wh*-movement and *wh*-clefts are the only possible pre-sluices in the ellipsis site, OPUS under contrast sluicing should be impossible: *wh*-movement is impossible because Saudi Arabic disallows P-stranding, and *wh*-clefts are impossible because clefts are incompatible with contrastive semantics (see Rodrigues et al. 2009 for just this claim regarding OPUS in Spanish). The results did not conform with the expectation of an account where OPUS necessarily derives from a *wh*-cleft. OPUS under contrast sluicing is acceptable. The results are compatible with a structural approach to ellipsis resolution only if a different structure is available in the ellipsis site, which we will argue to be resumption later on. The result is also compatible with a non-structural approach.

<sup>12</sup> Leung (2014a) suggests instead that some instances of OPUS in Emirati Arabic have no acceptable pre-sluice at all and that Merchant’s second form identity generalization is subject to parametric variation.

To investigate these questions, we conducted a web-based acceptability judgment experiment. Items were constructed crossing three factors: left-peripheral P (absent vs. present), ellipsis (sluicing vs. non-elliptical structure), and type of *wh*-phrase (simplex vs. complex). If *wh*-clefts are the only possible pre-sluice, we expect a significant main effect of the factor left-peripheral P, with the conditions without a left-peripheral preposition being uniformly unacceptable no matter whether ellipsis takes place or not.

The third factor concerns the type of *wh*-phrase and contrasts the behaviour of simplex *wh*-phrases (*who* and *what*) with that of *which*-phrases.<sup>13</sup> This factor was included to test whether the informativity of the remnant would affect the judgments on OPUS, as suggested by Nykiel (2013; 2015; 2017).

For ease of reference, Table 3 summarizes the theories mentioned and their predictions. ‘*Wh*-cleft’ in the table refers to the account according to which OPUS in Saudi Arabic rests exclusively on *wh*-clefts as pre-sluices. ‘*Wh*-resumption’ in the table refers to the account according to which OPUS might in addition involve a resumptive structure in the pre-sluice. No structure refers to the fine-grained predictions made by Nykiel’s model. The latter predicts an interaction between type of *wh*-phrase and ellipsis. As explained in the introduction, we focus on Nykiel’s work because it stands out among non-structural accounts in developing fine-grained predictions.

### 3.1 Methods

#### 3.1.1 Materials

The experiment fully crossed three binary factors in a  $2 \times 2 \times 2$  design. The three factors were left- peripheral P, ellipsis, and *wh*-type. We created sixty-four items with eight conditions each. This is illustrated in Table 4. Stimuli were presented to participants in a Latin square design; each participant thus saw exactly one condition of each item. This resulted in eight datapoints per condition per participant.

Each item consisted of a conjunctive statement. The first conjunct was made up of a simple S-V-PP clause as indicated in (14). The subjects of the first conjunct were a mix of male and female proper names and names of institutions. Most subjects were singular but some plural subjects were also included. To ensure that the DP remnants in the crucial condition would be construed as prepositional complements, all verbs were subcategorized for a PP and none allowed DP complements. The prepositional phrases were headed by six different prepositions: *ma* ‘with’, *la* ‘to’, *an* ‘about’, *ba* ‘in’, *alā* ‘for’, and *man* ‘from’. The complements of the prepositions were evenly split between animate and inanimate nouns. The second conjunct was introduced by *bas* ‘but’, followed by two lexicalisations of ‘I don’t know’, ‘I don’t

**Table 3:** Summary of predictions.

	<i>wh</i> -clefts	<i>wh</i> -resumption	No structure
Main effect of left-peripheral P	Yes	No	No prediction made
Main effect of ellipsis	No	Yes	No prediction made
Main effect of <i>wh</i> -type	No	No	No prediction made
Left-peripheral P* ellipsis	No	Yes	Yes
Left-peripheral P* ellipsis * <i>wh</i> -type	No	No	Yes

<sup>13</sup> A reviewer draws our attention to the potential relevance of Frazier & Clifton Jr (2011) in this connection, which found a general preference for D-linked over non-D-linked *wh*-phrases in sluicing generally. However, in the experiment all of the non-D-linked conditions (and none of the D-linked ones) run afoul of correlate-remnant harmony discussed in Dayal & Schwarzschild (2010) and Barros (2013). Given that the non-D-linked conditions are systematically degraded for this independent reason, Frazier & Clifton’s (2011) experiment should not be interpreted to show that there is a general preference for D-linked remnants.

**Table 4:** Experiment 1 Example set.

Raym tadūr            ʿalā maktb-at al-malk    ʿabdulʿazīz bas m-adrī ...  
 Reem looking.3FSG for library-F the-king Abdulaziz but NEG-know ...  
 ‘Reem is looking for King Abdulaziz Library, but I don’t know (for) which other library (she is looking).

Condition 1	<b>Left-peripheral P absent sluicing</b>	<b>Simplex</b>	ayš baʿd what else ‘... what else.’
Condition 2		<b>Complex</b>	ʾay maktba baʿd which library else ‘... which other library.’
Condition 3	<b>Let-peripheral P present sluicing</b>	<b>Simplex</b>	ʿalā ayš baʿd for what else ‘... for what else.’
Condition 4		<b>Complex</b>	ʿalā ʾay maktba baʿd for which library else ‘... for which other library.’
Condition 5	<b>Left-peripheral P absent non-elliptical</b>	<b>Simplex</b>	ayš baʿd tadūr            ʿalā what else looking.3FSG for ‘... what else she is looking for.’
Condition 6		<b>Complex</b>	ʾay maktba baʿd tadūr            ʿalā which library else looking.3FSG for ‘... which other library she is looking for.’
Condition 7	<b>Left-peripheral P present non- elliptical</b>	<b>Simplex</b>	ʿalā ayš baʿd tadūr for what else looking.3FSG ‘... for what else she is looking.’
Condition 8		<b>Complex</b>	ʿalā ʾay maktba baʿd tadūr for which library else looking.3 FSG ‘... for which other library she is looking.’

remember’, ‘I forget’ or ‘he/she didn’t say’. This was then followed by the target clause, either a full sentence with a gap (14a) or a sluice (14b). The versions with a gap resulted in P-stranding when the moved *wh*-phrase was a DP and in pied-piping when it was a PP.

- (14) S + V + PP + “I don’t know/remember” + TARGET
- Full sentence: [wh-remnant]<sub>DP/PP</sub> + V + (P) + gap
  - Sluice: [wh-remnant]<sub>DP/PP</sub>

Each stimulus was preceded by a brief sentence to contextualize it. Half of the items were followed by a simple yes/no comprehension question targeting the remnant or the antecedent clause to test participants’ attentiveness. Thus, the stimuli illustrated in Table 4 were preceded by sentence (15) and followed by question (16).

- (15) Raym tadūr            ʿalā maktb-āt ʿāma  
 Reem looking.3FSG for library-PL public  
 ‘Reem is looking for public libraries.’

- (16) Raym tadūr            ʿalā maktb-at al-malk Fahd?  
 Reem looking.3FSG for library-F the-king Fahd?  
 ‘Was Reem looking for King Fahad Library?’

We also constructed ninety-six fillers (i.e. 1.5 times the number of experimental items). These were also introduced by a context sentence and evenly distributed across four con-

structions: gapping (17), argument ellipsis (18), equational sentences (19), and *wh*-in-situ questions (20).

- (17) aly ʾaʿrf an-h Raym taʿzf ʿawd wa Nawf bayānū  
that know.1 that-it Reem play.3FSG lute and Noaf piano  
'I know that Reem plays the lute and Noaf the piano.'
- (18) ʿabdullah šarā bayt jadīd kal-h ʿašān ʾaḳ-ūh šarā  
Abdullah bought.3MSG house new all-it because brother-POSS.3M bought.3MS  
'Abdullah bought a new house because his brother bought one.'
- (19) al-aktb al-maḥṭūṭa ʿalā a-rraf b-aḡrfa Nawf hay katb-ī ḥaqt  
the-book.PL the-placed on the-shelf in-room Noaf she book.PL-POSS.1 of  
al-jāmʿa  
the-university  
'The books on Noaf's shelf are my school books.'
- (20) ʿabdullah yabī Fayṣl yaṭlb man ʾay maṭʿm?  
Abdullah want.3MSG Faisal order.3MSG from which restaurant  
'Which restaurant does Abdullah want Faisal to order from?'

Half of the fillers were clearly acceptable with the other half being unacceptable to various degrees.<sup>14</sup> Twenty-eight of the clearly acceptable fillers were followed by a yes/no comprehension question.

### 3.1.2 Participants and procedure

Forty-three adult native Saudi participants (all female: age between 18 and 60, mean 26) were recruited online from the female section of college of Arts, King Saud University. Their native status was judged based on their report and on a small paragraph they were asked to write before the experiment itself started. In exchange for their time and effort, participants were offered to enter a SR500 draw upon completion of the study one of whom was to be randomly selected once the study was over. Fourteen participants had to be excluded for scoring less than 80% accuracy on comprehension questions or for scoring more than 50% incorrect on clearly unacceptable fillers.<sup>15</sup> As a result, the complete data from twenty-nine participants was entered into the analysis.

Materials were presented and results recorded using Ixweb Farm (<http://spellout.net/ixwebfarm/>), version 0.3.7 (Drummond). Each item with its context sentence was presented in Arabic script, in the centre of the screen, with the context sentence and the item each on a separate line. Under the sentence there was a 7 point rating scale with 1 being the lower endpoint and 7 the upper endpoint. The endpoints were labelled in Saudi Arabic as 1 = impossible, I would never say or hear this and 7 = completely acceptable, I would definitely say it or hear it. Selecting a point on the scale automatically moved the experiment to the next page. To reduce the chance of participants getting distracted by other tasks, a timer of 40 seconds was set for each sentence, after which the experiment recorded

<sup>14</sup> The unacceptable fillers were a mix of the following conditions: Passive/active mismatches in gapping and argument ellipsis, multiple *wh*-questions, equatives with adverbial, prepositional, and indefinite NPs after the copula, overt preposition omission, and temporal adverbials mismatched with the tense of the verb. Since the judgments for the unacceptable fillers were not as clear as expected, the fillers were changed in later experiments.

<sup>15</sup> We believe that the reason the number of excluded participants is higher in this experiment compared to the experiments presented below is due to the length of this experiment. This experiment required 45 minutes to complete, while the other two experiments took 20 minutes.

a non-response and would move to the next page automatically. For items without a comprehension question, the next page would be the next item. For items with comprehension questions, the question was presented on the next page. This page was not timed and participants received feedback on the correctness of their answer to comprehension questions.

To be able to start the session participants had to give their informed consent. They were asked to complete a demographic information survey (age, gender, education, etc.), which also included questions about native dialect(s) and foreign language background. These data were analysed but not found to significantly influence the results. Participants were also asked to write a short paragraph on a topic of their choice in their native dialect, to confirm their status as native speakers of Saudi Arabic. Participants were informed that the experiment's aim was to elicit Saudi Arabic native speakers' intuitions about sentences in Saudi Arabic. Participants were then given instructions including an explanation of the rating scale, accompanied by an acceptable and an unacceptable example. All accompanying text was written in Saudi Arabic rather than Standard Arabic to avoid them using Standard Arabic rather than Saudi Arabic when judging the experiment items.<sup>16</sup>

Three practice items were presented in a fixed order, followed by an individually randomized presentation of the sixty-four experimental and ninety-six filler items.

### 3.2 Results

Our research question was whether *wh*-clefts are the only possible non-isomorphic preluice for OPUS in Saudi Arabic. We tackled this question by asking whether contrast sluicing would allow OPUS. Table 5 shows the average rating provided by participants for each of the eight Conditions. In general, OPUS under contrast sluicing is as acceptable as corresponding non-elliptical sentences both with simplex and complex *wh*-phrases. P-stranding in non-elliptical structures is significantly less acceptable than any of the other conditions.

This is obvious in Figure 1. The conditions without left-peripheral preposition with sluicing are significantly more acceptable both with simplex *wh*-phrases ( $M = 4.7$ ) and complex *wh*-phrases ( $M = 5.3$ ) than the non-elliptical P-stranding conditions with ( $M = 2.3$ ) and ( $M = 2.2$ ), respectively. As for the pied-piping conditions, both simplex *wh*-phrases and complex *wh*-phrases were rated as highly acceptable under sluicing ( $M = 5.4$ ) and ( $M = 5.3$ ) and in non-elliptical conditions ( $M = 5.2$ ) and ( $M = 5.1$ ), respectively.

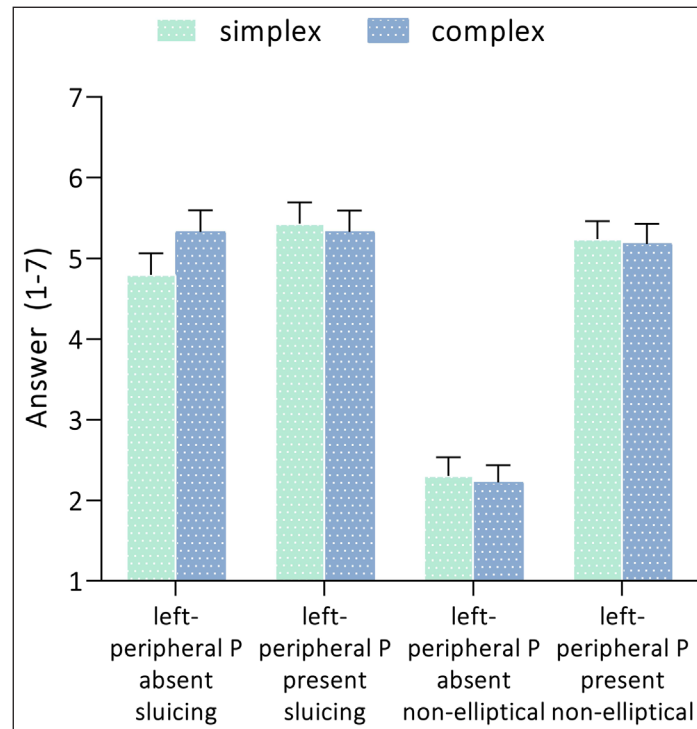
The data of 29 participants (232 datapoints per condition; a total of 1856 datapoints) were analysed using a linear mixed-effects model using 'lme4' package in R (Bates et al. 2014). Prior to the analysis, raw ratings were z-score transformed to eliminate some of

**Table 5:** Experiment 1: Mean acceptability rating by Condition (n = 29).

	Condition	Mean	SD
Condition 1	Left-peripheral P absent, sluicing, simplex	4.7913	1.96918
Condition 2	Left-peripheral P absent, sluicing, complex	5.3247	1.84467
Condition 3	Left-peripheral P present, sluicing, simplex	5.4217	1.81946
Condition 4	Left-peripheral P present, sluicing, complex	5.3391	1.93062
Condition 5	Left-peripheral P absent, non-elliptical, simplex	2.3074	1.74851
Condition 6	Left-peripheral P absent, non-elliptical, complex	2.2121	1.68446
Condition 7	Left-peripheral P present, non-elliptical, simplex	5.2445	2.03727
Condition 8	Left-peripheral P present, non-elliptical, complex	5.1810	2.03476

<sup>16</sup> The data for all four experiments were collected between June 2017 and March 2018 and were handled in compliance with the 1998 Data Protection Act.





**Figure 1:** Experiment 1: Mean acceptability rating by Condition (n = 29). Error bars represent the standard error of the mean (SEM).

the forms of scale bias that potentially arise with rating tasks (see Schütze and Sprouse 2014 for a review).<sup>17</sup> Fixed factors were left-peripheral P, ellipsis, and *wh*-type with two-levels each. Random intercepts and slopes were assumed for participants and items as random effects in order to control for individual variation as well as for any variation in the dependent variable across items. All reported P-values were estimated using the Satterthwaite approximation; R package ‘lmerTest’ (Kuznetsova et al. 2017).

As indicated in Table 6, results show a highly significant main effect of ellipsis ( $t = -5.740$ ,  $p = 2.56e-08$ ), with sluiced conditions rated on average as much more acceptable than non-elliptical conditions. We also found a significant main effect of *wh*-type ( $t = 3.444$ ,  $p < .001$ ).<sup>18</sup> Although there was no significant main effect of pied-piping ( $t = -1.050$ ,  $p = 0.29$ ), results show a highly significant interaction between left-peripheral P and ellipsis ( $t = 4.152$ ,  $p = 4.91e-05$ ) reflecting the fact that P-stranding in non-elliptical conditions is substantially degraded, while OPUS is acceptable to a degree comparable to pied-piping both under sluicing and in the non-elliptical conditions. The results also show

<sup>17</sup> We also ran the same analysis on the raw scores for all three experiments with the same overall results.

<sup>18</sup> To probe this result more deeply, we conducted an experiment with the same factorial design as experiment 1 except for the non-elliptical conditions, which contained resumptive pronouns instead of gaps. Null results were found; all conditions were highly acceptable (mean between 5.4 and 6.1) with no main effects or significant interactions. In other words, neither the main effect of *wh*-type nor the relevant interactions could be replicated from experiment 1. Given the size of the effect of *wh*-type on acceptability of the OPUS conditions, the failure to replicate is not entirely surprising because the experiment 1 is not powerful enough for such small effects.

The finding of the follow-up experiment can be summarized as follows: first, OPUS is acceptable under contrast sluicing independently of the complexity of the *wh*-remnant; no degradation was found from the lack of left-peripheral preposition in the sluicing remnant. The results fail to confirm the expectation based on Nykiel’s work that simplex *wh*-phrases should lead to less acceptable OPUS examples than complex *wh*-phrases. Second, resumption can be used in contrastive non-elliptical *wh*-questions for all types of the *wh*-phrase used in the experiment (*who*, *what*, *which NP*) suggesting that resumption in Saudi Arabic behaves differently from what has been described for other Arabic dialects; this point will be further explored in Experiment 3 (Aoun et al. 2010).

**Table 6:** Experiment 1: Summary of linear mixed effects models P-values estimated using the Satterthwaite approximation (\*\*\*)  $p < .001$ .

	t-value	Pr(> t )
(Intercept)	7.386	3.26e-12***
Left-peripheral P	-1.050	0.294580
Ellipsis	-5.740	2.56e-08***
Wh-type	3.444	0.000766***
Left-peripheral P * ellipsis	4.152	4.91e-05***
Left-peripheral P * wh-type	-2.856	0.004619**
Ellipsis * wh-type	-2.937	0.004302**
Left-peripheral P * ellipsis * wh-type	2.356	0.020677*

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1.

a significant three-way interaction and two two-way interactions between *wh*-phrase type, pied-piping, and ellipsis. This is driven by the different behaviours of simplex and complex *wh*-phrases under sluicing and P-stranding. (See footnote 18 for discussion).

Since the data was not normally distributed, a non-parametric paired Wilcoxon tests was used to determine whether there is a difference between left-peripheral P present and left-peripheral P absent under sluicing with different types of *wh*-phrases. We found no significant difference between condition 4 'left-peripheral P present under sluicing' and condition 2 'left-peripheral P absent under sluicing' with complex *wh*-phrases ( $p = .91$ ). However, we did find a significant difference between condition 3 'left-peripheral P present under sluicing' and condition 1 'left-peripheral P absent under sluicing' with simplex *wh*-phrases ( $p < 0.001$ ), both conditions were highly acceptable ( $M = 4.7$ ) and ( $M = 5.4$ ), respectively. We also found a significant difference between OPUS with simplex *wh*-phrases (condition 1) and complex *wh*-phrases (condition 2).

### 3.3 Discussion

We interpret the results from the non-elliptical conditions as follows: P-stranding is ungrammatical and pied-piping is grammatical. This is in line with all grammatical descriptions, which characterize Saudi Arabic is a non P-stranding language. Therefore, a *wh*-phrase cannot relate to a gap in the position of the complement of a preposition. We also found OPUS to be acceptable to the same degree as pied-piping with ellipsis and pied-piping in non-elliptical conditions. We interpret this to mean that the cases of OPUS tested here are grammatical. This is broadly in line with previous descriptions of Arabic dialects but conflicts with Merchant's (2001) form identity generalization II. However, the fact that the tested sluices are contrastive means that they cannot have *wh*-clefts as their pre-sluice, as the previous literature on Arabic had claimed. Recall that *wh*-clefting is incompatible with the kind of contrastive structures used in the experiment.

As an aside, we should note that there was a subgroup of participants who rejected all eight experimental conditions. These speakers might not accept the relevant type of contrastive syntax in *wh*-questions or they might reject the experimental items on other as yet undetermined grounds. We return to this issue in experiment 2.

A priori, the results of experiment 1 are also compatible with a non-structural approach to ellipsis resolution. We should stress, however, that unlike in Molimpakis's results on Greek, where the absence of a left-peripheral preposition leads under sluicing to a degradation with all types of *wh*-phrases, we found no significant difference between the presence and absence of a left-peripheral preposition under sluicing with *which*-phrases.

This lack of a degradation was replicated in the experiment mentioned in footnote 18. The absence of an effect in Saudi Arabic and its presence in Greek is surprising under a non-structural approach: Why should the presence of the preposition under sluicing matter in Greek but not in Saudi Arabic? We seem to be dealing with a cross-linguistic difference here. As noted in the introduction, ellipsis resolution is not easily parameterized. To account for the difference between Saudi Arabic and Greek, however, a non-structural theory needs to do just that. From the perspective of a structural approach on the other hand, the strategy for ellipsis resolution does not need to be parameterized. What differs between the experiments under a structural perspective is not the resolution strategy but the resources for constructing pre-sluices. Arabic does and Greek does not allow resumptive pronouns. This is a difference between the languages that is independently learned by speakers and feeds into ellipsis resolution without problems given a structural approach to the ellipsis site.

While we did find a significant difference between the absence and presence of the preposition in elliptical conditions with simplex *wh*-phrases (as expected by Nykiel's account), the effect was smaller than could reliably be detected by the experiment. Given that the effect failed to replicate in the follow-up experiment described in footnote 18, we set this effect aside here.

The following experiments probe this line of explanation by exploring in various ways whether resumption in the ellipsis site could be the source of OPUS.

#### **4 Experiment 2: Do resumptive pronouns lead to measurable degradation in Saudi Arabic?**

In experiment 2 we probe the idea that OPUS relies on a resumptive structure in the ellipsis site. This can only be done if there is a discernible signal from resumption. For example, if *wh*-resumption were generally less acceptable than *wh*-movement, then all structures with resumption should be less acceptable than minimally different structures without resumption (i.e. conditions 1, 5, 6, 7 and 8 in the experiment should be less acceptable than conditions 2, 3, and 4). Alternatively, if *wh*-resumption was less acceptable than *wh*-movement unless a resumptive pronoun is obligatory in a particular position, then the unforced use of optional resumptive pronouns should lead to a measurable degradation (i.e. conditions 5, 6, 7 and 8 in the experiment should be less acceptable than conditions 1, 2, 3, and 4). Finally, if resumptives had a mild semantic incompatibility with contrast,<sup>19</sup> then conditions with both resumption and contrast (i.e. conditions 1, 5, and 7) should be less acceptable than resumptive conditions without contrast (i.e. conditions 2, 4, 6, and 8) and contrastive conditions without resumptive pronouns (i.e. condition 3).

Some of the literature on resumption treats resumption as a last resort phenomenon (Rizzi 1990; Shlonsky 1992; Aoun 2000; Aoun et al. 2001). This may suggest – but by no means forces – the hypothesis that structures with resumptive pronouns are less acceptable than structures without them. The idea that there might be an acceptability cost of resumption (or of unforced resumption or of resumption in conjunction with contrast) thus underpins the logic of the experiment. The experiment also tries to shed light on the question of what drove the low acceptance of all eight conditions by some speakers in experiment 1. In particular, these speakers might have rejected the sentences based on the way contrast is expressed or based on some other unknown property of the examples. We probe this by explicitly introducing contrast as a factor. Finally, the non-contrastive

<sup>19</sup> While there is no literature specifically suggesting that resumptives are incompatible with contrast, it is known that optional resumptives impose certain semantic restrictions (see Doron 1982; Sichel 2014), so that the idea pursued here does not seem a priori implausible. It is suggested by the results from experiment 1.

conditions additionally serve to verify that Saudi Arabic allows OPUS under merger type sluicing in line with the other Arabic dialects discussed in the literature cited above.

To investigate the question of whether there is a resumptive penalty and whether it shows up with examples of OPUS, we conducted a web-based acceptability judgment experiment. Items were constructed crossing three factors: Preposition (present vs. absent in the antecedent), ellipsis (sluicing vs. non-elliptical structure), and contrast (contrastive vs. non-contrastive). See Table 8. The left peripheral *wh*-phrase in all conditions was a complex DP. We chose complex (d-linked) *wh*-phrases since they are uncontroversially able to antecede resumptive pronouns in all Arabic dialects. All conditions involved a left peripheral DP in the target clause; there were no conditions with pied-piping of prepositions in this experiment. The factor of preposition distinguished instead between cases where that left-peripheral DP corresponds to the complement of a preposition in the antecedent (preposition present) and cases where it does not (preposition absent), i.e., where the DP acts as the complement of a verb in the antecedent instead of as the complement of a preposition. The factor of ellipsis distinguished between sluices and non-elliptical structures, but in contrast to experiment 1, the non-elliptical structures do not contain gaps but resumptive pronouns. Finally, the third factor distinguished contrastive examples like in experiment 1 from non-contrastive ones.

We hypothesized that the ellipsis site can, and at least under contrastive OPUS must, contain a resumptive pronoun. We consider a variety of hypotheses that assign no cost to resumption, a cost to resumption in all cases, a cost to resumption unless forced, or a cost to resumption in contrastive environments. Furthermore, from the perspective of Nykiel's model, the experiment manipulates the factor of structural persistence. In the conditions without a PP in the antecedent, a DP remnant is forced (and obeys persistence), while in the conditions with a PP in the antecedent a DP remnant violates persistence and may alternate with a PP remnant. To the best of our knowledge, this is the first systematic test of structural persistence in a judgment task.

Briefly, persistence predicts that in experiment 1 and the experiment described in footnote 18 DP remnants should be less acceptable than PP remnants and that in experiment 2, DP remnants in the condition with a preposition in the antecedent should be less acceptable than in the condition without a preposition in the antecedent. The expected effect of persistence did not materialize in the first experiment.<sup>20</sup> No prediction about the non-elliptical conditions are made.

A theory which assumes structure at the e-site predicts that if resumption is not costly, no main effect or interactions are predicted. That is, all conditions should be rated equally. If resumption is costly in all cases, we would expect a main effect of preposition and an interaction with preposition and ellipsis only (elliptical conditions with no preposition in the antecedent don't require a resumptive in the ellipsis site). That is, sluices with no preposition in the antecedent should be more acceptable than the other conditions because they do not force or overtly involve resumption. If resumption is costly unless it is forced, the unforced resumptive in conditions 7 and 8 below should give a strong signal. Finally, a theory that assumes that resumption is costly only in the contrastive environment, would predict only a main effect of contrast but no main effect of preposition or ellipsis. Under this view, all non-contrastive conditions are expected to be rated higher than all contrastive conditions.

<sup>20</sup> A reviewer suggests that Nykiel (2013; 2015; 2017) makes this prediction only for the non-contrastive cases since she never explicitly deals with contrastive sluices. Given that persistence is essentially a syntactic priming effect, we see no reason why the effects of structural persistence should be limited to non-contrastive environments. However, even if we grant that contrastive sluices might be exempt from effects of structural persistence, the expectation for the non-contrastive conditions in the experiment are very clear.

## 4.1 Methods

### 4.1.1 Materials

Experiment 2 again had a  $2 \times 2 \times 2$  design. We crossed the three factors preposition (present/absent in the antecedent), ellipsis (sluicing/non-elliptical), and contrast (contrast/non-contrast), creating forty-eight items for each of the eight conditions illustrated in Table 7. These were presented to participants in a Latin square design; resulting in six datapoints per condition per participant.

**Table 7:** Example set for Experiment 2.

Condition 1	<b>sluicing, preposition present</b>	<b>contrast</b>	al-qana al-ʔawlā saw-t maqābla maʕ wazīr at-taʕlīm the-channel the-first made-3FSG interview with minister the-education bas nasīt ʔay wazīr baʕd but forget.1 which minister else 'Channel 1 made an interview with the minister of education but I forgot which other minister.'
Condition 2		<b>non-contrast</b>	al-qana al-ʔawlā saw-t maqābla maʕ wazīr saʕūdī the-channel the-first made-3FSG interview with minister saudi bas nasīt ʔay wazīr but forget.1 which minister 'Channel 1 made an interview with a Saudi minister but I forgot which minister.'
Condition 3	<b>sluicing, preposition absent</b>	<b>contrast</b>	al-qana al-ʔawlā qābl-t wazīr at-taʕlīm bas nasīt the-channel the-first interview-3FSG minister the-education but forget.1 ʔay wazīr baʕd which minister else 'Channel 1 interviewed the minister of education but I forgot which other minister.'
Condition 4		<b>non-contrast</b>	al-qana al-ʔawlā qābl-t wazīr saʕūdī bas nasīt the-channel the-first interview-3FSG minister saudi but forget.1 ʔay wazīr which minister 'Channel 1 interviewed a Saudi minister but I forgot which minister.'
Condition 5	<b>non- elliptical, preposition present</b>	<b>contrast</b>	al-qana al-ʔawlā saw-t maqābla maʕ wazīr at-taʕlīm the-channel the-first made-3FSG interview with minister the-education bas nasīt ʔay wazīr baʕd saw-t maqābla ma-ʕh but forget.1 which minister else made-3FSG interview with-him 'Channel 1 did an interview with the minister of education but I forgot which other minister channel 1 did an interview with him.'
Condition 6		<b>non-contrast</b>	al-qana al-ʔawlā saw-t maqābla maʕ wazīr saʕūdī bas the-channel the-first made-3FSG interview with minister saudi but nasīt ʔay wazīr saw-t maqābla ma-ʕh forget.1 which minister made-3FSG interview with-him 'Channel 1 did an interview with a Saudi minister but I forgot which minister channel 1 did an interview with him.'
Condition 7	<b>non- elliptical, preposition absent</b>	<b>contrast</b>	al-qana al-ʔawlā qābl-t wazīr at-taʕlīm bas nasīt the-channel the-first interview.3FSG minister the-education but forget.1 ʔay wazīr baʕd qābl-t-h whichminister else interview-3FSG-him 'Channel 1 interviewed the minister of education but I forgot which other minister channel 1 interviewed him.'
Condition 8		<b>non-contrast</b>	al-qana al-ʔawlā qābl-t wazīr saʕūdī bas nasīt the-channel the-first interview-3FSG minister saudi but forget.1 ʔay wazīr qābl-t-h which minister interview-3FSG-him 'Channel 1 interviewed a Saudi minister but I forgot which minister channel 1 interviewed him.'



Materials used were similar to those from experiment 1. However, the non-elliptical structures in experiment 2 did not contain gaps but resumptive pronouns instead. Moreover, the type of verb in the antecedent was different from experiment 1. Given that the presence or absence of the preposition is a factor in this experiment, two types of verbs were used: as in experiment 1, verbs that only subcategorized for a PP and did not tolerate a DP (21), and verbs that only subcategorized for a DP (22). Moreover, in the non-elliptical conditions, the *wh*-phrase related to a resumptive pronoun instead of a gap. Animate and inanimate correlates and remnants were freely mixed.<sup>21</sup>

- (21) DP + V + PP + TARGET  
 a. Full sentence: [*wh*-remnant]<sub>DP</sub> + V + P + resumptive pronoun  
 b. Sluice: [*wh*-remnant]<sub>DP</sub>
- (22) DP + V + DP + TARGET  
 a. Full sentence: [*wh*-remnant]<sub>DP</sub> + V + resumptive pronoun  
 b. Sluice: [*wh*-remnant]<sub>DP</sub>

For this experiment, stimuli were not preceded by a sentence to contextualize them. However, as in experiment 1, half of the items were followed by a simple yes/no comprehension question. We also constructed seventy-two fillers. These were evenly distributed across four constructions: involving resumption pronouns (23), (first) conjunct Agreement (24), adjectival agreement (25), and NPIs (26).

- (23) ʾay waḥd haw aly qāl Maḥmd ʾan-h kān yadr  
 which one he that said.3MSG Mohammed that-it was study.3MSG  
 maʿh b-aʾmrīkā?  
 with-him in-america  
 ‘Who did Mohammed say that used to study in the US with him?’
- (24) kal mara n-ašūf falm lāzm Dayma wa Dāna yajls-ūn janb baʿd  
 all time PL-see movie must Deema and Dana sit-PL side some  
 ‘Every time we see a movie, Deema and Dana must sit side by side.’
- (25) ḥaḍrt Nawf al-maḥāḍr-āt al-mahma wa ḡābt ʿan  
 attend.3FS Noaf the-lecture.PL the-important.FSG and absent from  
 al-maḥāḍr-āt al-bāqya  
 the-lecture.PL the.rest  
 ‘Noaf attended the important lectures and was absent for the rest’.
- (26) ʿabdurraḥmn mā ʿamrh rāḥ l-adbī bas qad rāḥ l-landn  
 Abdulrahman NEG life go.3MSG to-Dubai but already go.3MSG to-london  
 ‘Abdulrahman has never been to Dubai but he has been to London.’

As in experiment 1, half of the fillers were clearly acceptable with the other half being unacceptable to various degrees.<sup>22</sup> Twenty-four of the acceptable fillers were followed by a yes/no comprehension question.

<sup>21</sup> A posthoc test of the data in experiment 1 had shown no animacy effects.

<sup>22</sup> The unacceptable fillers were a mix of the following conditions: impossible reconstruction structures, gender and number mismatch, and unlicensed polarity items.

### 4.1.2 Participants

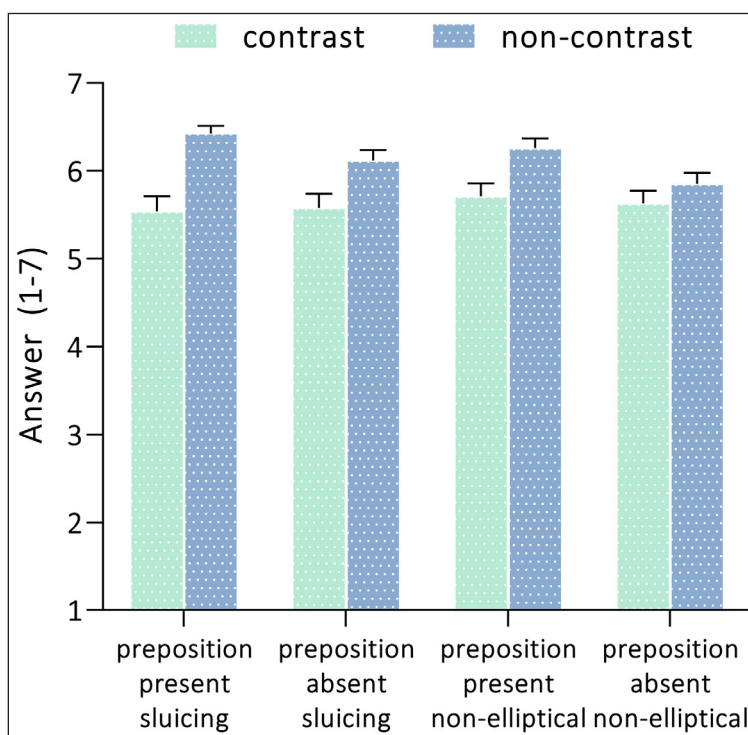
Seventy-eight adult native Saudi participants (21 male and 57 female: age between 18 and 40, mean 28) were recruited online. All participants provided informed consent prior to participation. Unlike in experiment 1, there was no prize draw for this experiment. Eight participants had to be excluded for scoring less than 80% accuracy on comprehension questions or for scoring more than 50% incorrect on clearly unacceptable fillers, resulting in the complete data from seventy participants being entered into the analysis.

### 4.2 Results

Our research questions asked whether there is a resumptive penalty and whether it shows up under sluicing with OPUS. The experiment also tried to shed light on the question of what drove the low acceptance of all eight conditions by some speakers in experiment 1.

The overall results (n = 70) are indicated in Figure 2. We again found that there is a class of speakers who reject all contrastive conditions.<sup>23</sup> The results for these speakers (n = 13) are given separately in Figure 3. Given the small dataset, we were unable to investigate these data very deeply. Figure 3 indicates that these participants generally reject the contrastive conditions (with or without preposition and in non-elliptical and elliptical structures alike). These speakers' judgments were excluded from the rest of the analysis. We have no insight to offer into what exactly drove these speakers to reject all contrastive conditions.<sup>24</sup>

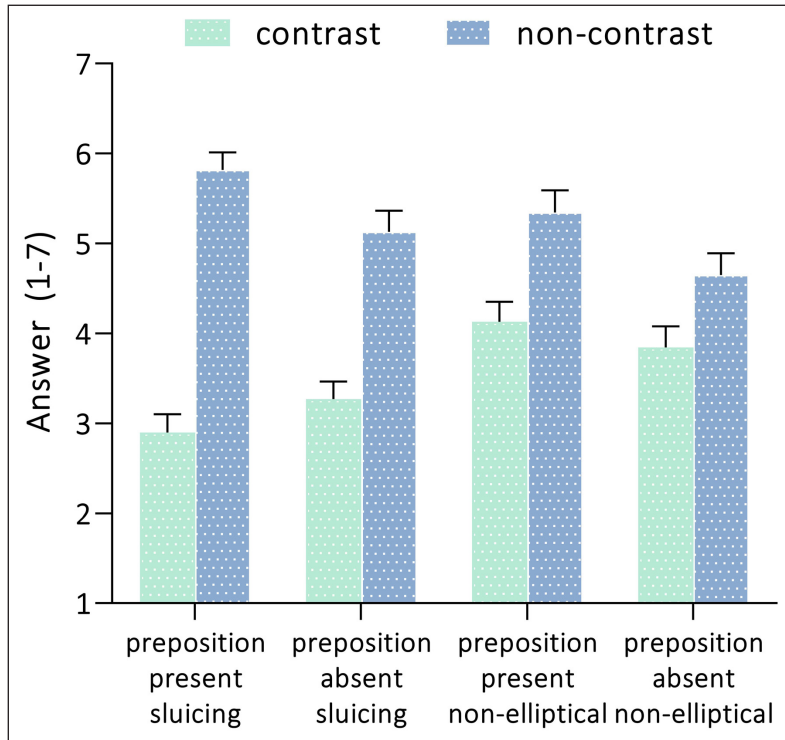
The data of the remaining 57 participants (see Figure 4, 342 datapoint per condition; a total of 2736 datapoints) were analyzed further. Table 8 shows the average rating provided



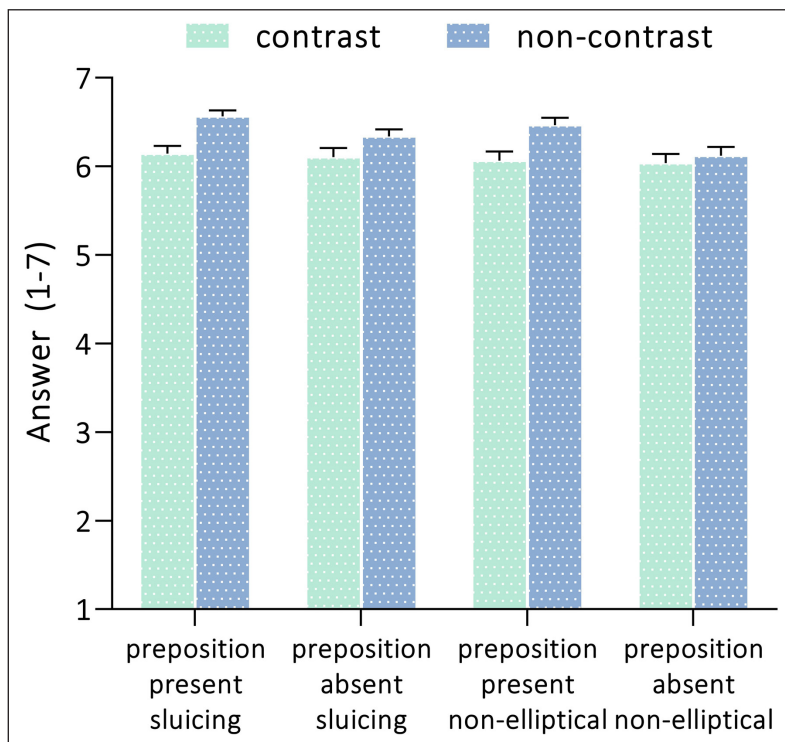
**Figure 2:** Experiment 2: Mean acceptability rating by Condition (n = 70). Error bars represent SEM.

<sup>23</sup> The criteria for choosing these participants was rating condition 1 ‘Preposition present, sluicing, contrast’ with 4 or less.

<sup>24</sup> An anonymous reviewer suggests the possibility that the speakers who rejected all of the contrastive conditions might have preferred a different phrasing or – in view of the fact that the non-elliptical variants are more acceptable than the elliptical variants – that stress alignment goes wrong for these speakers in the elliptical conditions. We have no specific data either confirming or disconfirming these conjectures.



**Figure 3:** Experiment 2: Mean acceptability rating by Condition (n = 13). Error bars represent SEM.



**Figure 4:** Experiment 2: Mean acceptability rating by Condition (n = 57). Error bars represent the standard error of the mean (SEM).

by participants for each of the eight conditions. In general, the presence/absence of the preposition in the antecedent did not affect the acceptability of the conditions.

As illustrated in Figure 4, OPUS is highly acceptable both with contrastive (M = 6.03) and with merger type sluicing (M = 6.4). Conditions without a preposition were also

rated as highly acceptable both under contrast sluicing ( $M = 6.02$ ) and merger sluicing ( $M = 6.3$ ). This result is mirrored in the non-elliptical conditions; with all four conditions being highly acceptable.

As in the previous experiment, raw ratings were z-score transformed prior to analysis. A linear mixed-effects model was fitted with preposition, ellipsis, and contrast as fixed factors and subject and item as random effects with random slopes and intercept.<sup>25</sup> As indicated in Table 9, no significant main effects or interactions were found. This is due to all eight conditions being highly acceptable. The fact that there was no significant main effect of presence/absence of a preposition in the antecedent ( $t = 0.103$ ,  $p = 0.918$ ), no interaction between ellipsis and the presence/absence of a preposition in the antecedent ( $t = 0.148$ ,  $p = 0.882$ ), nor a three way interaction ( $t = -0.417$ ,  $p = 0.677$ ), indicates that the presence or absence of the preposition in the antecedent did not affect the acceptability of the results in either elliptical or in non-elliptical structures.

### 4.3 Discussion

The factor of contrastivity was included in this experiment to probe the judgment patterns of the type of speakers who rejected all eight conditions in experiment 1. The experiment confirmed the existence of a set of speakers who consistently reject contrast sluicing (whether the remnant is the complement of a verb or of a preposition). These speakers

**Table 8:** Experiment 2: Mean acceptability rating by Condition ( $n = 57$ ).

	Condition	Mean	SD
Condition 1	Preposition present, sluicing, contrast	6.0351	1.47071
Condition 2	Preposition present, sluicing, non-contrast	6.4647	1.32658
Condition 3	Preposition absent, sluicing, contrast	6.0265	1.49607
Condition 4	Preposition absent, sluicing, non-contrast	6.3655	1.49615
Condition 5	Preposition present, non-elliptical, contrast	5.9735	1.50590
Condition 6	Preposition present, non-elliptical, non-contrast	6.2375	1.51246
Condition 7	Preposition absent, non-elliptical, contrast	5.9471	1.53335
Condition 8	Preposition absent, non-elliptical, non-contrast	5.9971	1.70552

**Table 9:** Experiment 2: Summary of linear mixed effects models P-values estimated using the Satterthwaite approximation (\*\* $p < .001$ ).

	t-value	Pr(> t )
(Intercept)	-0.530	0.597
Preposition	0.103	0.918
Ellipsis	0.203	0.839
Contrast	1.369	0.173
Preposition * ellipsis	0.148	0.882
Preposition * contrast	-0.053	0.957
Ellipsis * contrast	-0.360	0.719
Preposition * ellipsis * contrast	-0.417	0.677

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1.

<sup>25</sup> A mixed effects model was run on the data of the complete 70 participants. We found similar results except for a significant main effect of Contrast ( $t = 3.507$ ,  $p < .001$ ). This main effect of contrast was driven by the 13 speakers who rejected all contrastive conditions.

also found the corresponding non-elliptical contrastive examples degraded. This suggests that something about the contrastive conditions per se is problematic for these speakers; there were no interactions between contrastivity, ellipsis, and absence of preposition that we could use to shed further light on the grammar of OPUS (see Rodrigues et al. 2009 for this type of interaction and for an explanation for how it might come about).

For the majority of speakers, we found no significant difference between contrastive and non-contrastive conditions. We also failed to find a significant effect of ellipsis, preposition, or an interaction. This null result is expected on the view that resumption carries no cost. If resumption were generally costly, we would expect all non-elliptical conditions and the contrastive condition with a PP in the antecedent to show a significant degradation; the remaining elliptical conditions do not force a resumptive in the ellipsis site and thus should be judged more acceptable. We did not find this pattern. If unforced resumption were costly, we would expect a significant boost in all conditions not requiring resumption in the ellipsis site (all non-contrastive elliptical conditions and the contrastive elliptical condition with no PP in the antecedent); we would furthermore also expect non-elliptical conditions with a PP to improve compared the conditions without a PP, since resumption into a PP is obligatory. We did not find such a pattern. If resumption were disallowed specifically with contrastive *wh*-phrases, all contrastive conditions (elliptical or not) except for the elliptical condition with no PP in the antecedent should be significantly worse than the non-contrastive ones. Again, we did not find this pattern. Finally, above we identified a prediction of Nykiel's model: Persistence predicts that, among elliptical conditions, those with a PP in the antecedent should be accepted less readily than those without a PP in the antecedent. No such effect was found.

Though a null result, our findings are fully compatible only with the hypothesis that the ellipsis site contains structure and that resumption carries no cost.

### 5 Experiment 3: OPUS when no well-formed pre-sluice is available in Saudi Arabic

Based on the results of experiments 1–2, we hypothesized that OPUS specifically with merger type sluicing should be acceptable whenever an acceptable synonymous non-elliptical structure (a cleft or a sentence with resumption) is available as a pre-sluice (see Barros et al. 2014; Abels 2017a).<sup>26</sup> To test this hypothesis we set out to compare examples where clefts and/or *wh*-resumption are possible with examples where neither is possible. Recall from section 2 that Arabic *when* can only be used in the *wh*-movement strategy and is incompatible with both the cleft and resumption strategies. (The same is true of *how* and *why*, but since these do not occur as the complements of prepositions, we do not consider them further.) *Where*, on the other hand, is compatible with all three question formation strategies. (These claims from section 2 are verified by the non-elliptical conditions in this experiment.) On a structural approach relying on a well-formed structure at the ellipsis site, only *where* should give rise to fully acceptable cases of OPUS. Examples with *when* should be less acceptable due to the lack of a well-formed source. That is, if the acceptability of OPUS in the previous experiments is attributed to the availability of a possible source in the e-site, we expect a significant effect of the type of *wh*-remnant such that *where* as OPUS remnant should be fully acceptable and *when* should be unacceptable. Under Nykiel's approach, OPUS should be equally (un)accept-

<sup>26</sup> The restriction to merger-type sluicing is important. As noted in the literature on sluicing in a variety of languages (see for example Chung et al. 1995; Stjepanović 2008; Leung 2014a) sprouting never allows OPUS. Under an approach to sluicing that allows paraphrases in the ellipsis site this can be made to follow from Abels's (2017a:13) FIT condition, which requires the remnant to fit into the antecedent (in place of the correlate if there is one).



able with *where* and with *when* as remnants; this is predicted because all factors that enter her model are held constant: all examples involve sluicing (construction type), have a PP in the antecedent (structural persistence is violated throughout), involve contentful correlates (informativity of the correlate), and involve PPs that have no semantic dependency with the verb. Recall that under Nykiel’s (2015) criteria, a verb depends on the preposition if the sentence without the PP does not entail the sentence with the PP. In the experimental stimuli, all verbs are independent of the PP by this criterion. Moreover, prepositions are said to depend on the verb, if the predicate cannot be replaced by a bland *do* or *happen* type predicate without changing the meaning of the preposition. Again, the stimuli have independent PPs by this criterion. Thus, Nykiel’s model predicts the absence of an effect of *wh*-type. The results confirm the predictions of the structural approach. Surprisingly though, we found the examples with *when* to be more acceptable than their hypothesized pre-sluice, a point to which we return in the discussion.

We conducted a web-based acceptability judgment experiment. Items were constructed crossing three factors: Left-peripheral P (absent vs. present), ellipsis (sluicing vs. non-elliptical structure),<sup>27</sup> and *wh*-type (*where* vs. *when*). For ease of reference, Table 10 summarizes mentioned theories and their predictions.

## 5.1 Methods

### 5.1.1 Materials

The experiment again followed a 2 × 2 × 2 design. Crossing the three factors left-peripheral P, ellipsis, and *wh*-type, we created forty-eight items with eight conditions each. One item with all eight conditions is illustrated below in Table 11. Stimuli were presented to participants in a Latin square design; resulting in six data points per condition per participant.

The structure of the material used was similar to the one in experiment 1. However, unlike experiment 1, where the non-elliptical conditions without a left-peripheral preposition involved P-stranding, the non-elliptical sentences without pied-piping in the present experiment were either full *wh*-clefts or questions with resumption of the *wh*-phrase. The non-elliptical conditions with pied-piping were regular *wh*-movement structures in the current experiment.

Similar to experiment 2, stimuli were not accompanied by a context sentence. All experimental items were followed by a simple comprehension question. We also constructed seventy-two fillers.<sup>28</sup> These were evenly distributed across three constructions: *wh*-clefts (D-linked, simplex, and *where*) (27), and a number of structures with the words

**Table 10:** Summary of theories and predictions.

	Structure at e-site	Nykiel (2014; 2015; 2017)
Predictions	A significant main effect of <i>wh</i> -type and an interaction between <i>wh</i> -type and ellipsis. The acceptability of OPUS correlates with the availability of an alternative source in the e-site. Since <i>wh</i> -clefting and resumption are compatible with <i>where</i> but not with <i>when</i> , this should be mirrored under sluicing.	No main effects of <i>wh</i> -type. OPUS with <i>when</i> and <i>where</i> should be uniformly (un)acceptable, regardless of the compatibility of <i>wh</i> -cleft or <i>wh</i> -resumption with different <i>wh</i> -types.

<sup>27</sup> The non-elliptical structures involved *wh*-clefts and resumptive structures in equal numbers. Since we had no reason to suspect the two to behave differently, they are treated as a single factor.

<sup>28</sup> The unacceptable fillers were contrastive *wh*-clefts (27) along with gender and number mismatches for nouns and adjectives similar to the structures (28) and (29).

**Table 11:** Experiment 3 Example set.

Condition 1	<b>Left-peripheral P absent sluicing</b>	<b>where</b>	Nawf ʔal't ta'mīn ʂaḥī man makān bas m-adrī wayn noaf got.3FSG insurance health from place but NEG-know.1 where 'Noaf got health insurance from someplace but I don't know where.'
Condition 2		<b>when</b>	Nawf tadr̄s man zamān bas m-adrī matā Noaf study.3FSG from time but NEG-know.1 when 'Noaf has been studying for some time but I don't know when.'
Condition 3	<b>Left-peripheral P present sluicing</b>	<b>where</b>	man wayn from where '... from where.'
Condition 4		<b>when</b>	man matā from when '... since when.'
Condition 5	<b>Left-peripheral P absent non-elliptical</b>	<b>where</b>	wayn ʔal't ta'mīn ʂaḥī ma-nh where got.3FSG insurance health from-it '... where she got health insurance from it.'
Condition 6		<b>or</b>	wayn haw aly ʔal't ta'mīn ʂaḥī manh where he that got.3FS insurance health from-it '... where it is that she got health insurance from.'
	<b>when</b>	matā tadr̄s man-h when study.3FSG from-it	
Condition 7	<b>Left-peripheral P present non-elliptical</b>	<b>where</b>	man wayn ʔal't ta'mīn ʂaḥī from where got.3FSG insurance health '... from where she got health insurance.'
		<b>when</b>	man matā tadr̄s from when study.3FSG '... since when she has been studying.'
Condition 8			

for place (28) and time (29) but used in ways that were very different from their use in the experimental items.

(27) *Wh*-clefts

- a. ʔay wazāra hay aly kalm-hā ʕabdulʕaziz?  
which ministry it that talk.3MSG-it Abdulaziz  
'Which ministry was it that Abdulaziz contacted?'
- b. mayn haw aly ʔarbt ʕal-ih as-sayāra?  
who he that broke.3FSG on-him the-car  
'Who was it that the car broke down on?'
- c. ayš haw aly Maḥmd yabī yaštr-ih?  
what it that Mohammed want.3MSG buy.it  
'What was it that Mohammed wanted to buy?'
- d. wayn haw aly ʔamhā waʕdthā tarūḥ l-ah?  
where it that mother-her promise.3FSG go.3FSG to-it  
'Where is it that her mother promised her to go to?'

- (28) as-hshawaar' al-waas'a kant maqfoula li-ftra ma'eenā bas ba'deen  
the.street.F.PL the.wide.FSG was closed for-time specific but after  
fath-t  
open.3FSG-F  
'The wide streets were closed for some time but then it was opened.'

- (29) al-mahl maqfl man zamaan bas ‘adhn naaween yafthoun far’  
 the-shop close from time but think.1 plan.PL open.PL branch.SG.M  
 jadeed qareeb  
 new.SG.M soon  
 ‘The shop has been closed for some time, but I think they are planning to open a new one soon’.

**5.1.2 Participants**

Eighty adult native Saudi participants (7 male and 72 female: age between 18 and 60, mean 26) were recruited online. All participants provided informed consent prior to participation. Unlike experiment 1, there was no prize draw for this experiment. Six participants had to be excluded for scoring less than 80% accuracy on comprehension questions or for scoring more than 50% incorrect on clearly unacceptable fillers, resulting in the complete data from seventy-four participants being entered into the analysis.

**5.2 Results**

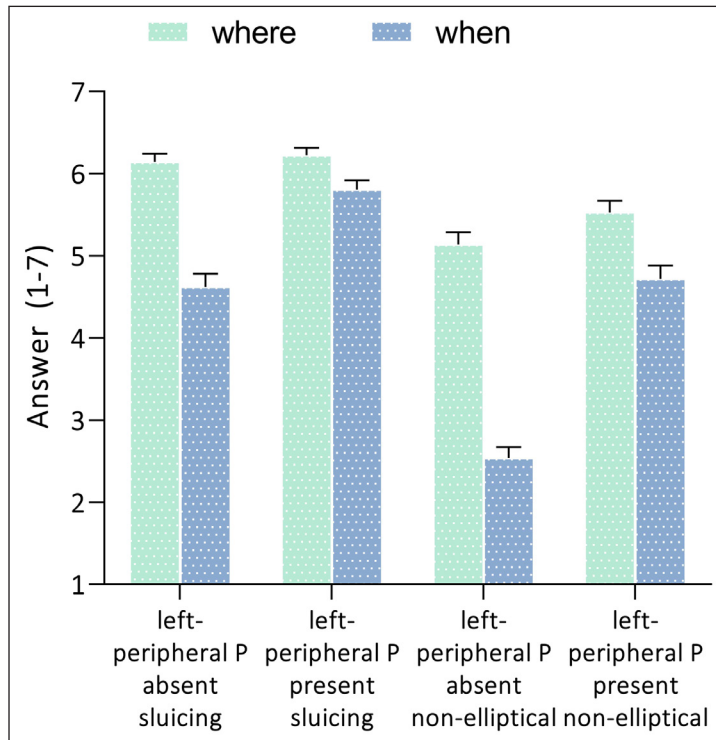
Our research questions asked whether the acceptability of OPUS is driven by the availability/lack of an alternative source at the e-site. Table 12 shows the average rating provided by participants for each of the eight conditions. In general, lack of a left-peripheral preposition (both in elliptical and non-elliptical conditions) was significantly more acceptable with *where* than with *when*. Recall that in condition 5 and condition 6 ‘left-peripheral P absent, non-elliptical’, the non-elliptical structures involved *wh*-clefts and resumptive structures in equal numbers. As we expected, both *wh*-clefts and *wh*-resumption are equally compatible with *where* (means of  $M = 5.09$  and  $M = 5.1$ , respectively). Similarly, both *wh*-clefts and *wh*-resumption are equally incompatible with *when* (means of  $M = 2.8$  and  $M = 2.2$ , respectively). Thus, we report the results for clefts and resumption together in what follows.

As illustrated in Figure 5, the conditions lacking a left-peripheral preposition are significantly more acceptable with *where* both under sluicing ( $M = 6.1$ ) and in non-elliptical structures ( $M = 5.1$ ) compared to their counterparts with *when* ( $M = 4.6$  for sluicing and  $M = 2.5$  for the non-elliptical condition). As for the conditions with left-peripheral prepositions, both *where* and *when* were rated with comparable acceptability scores in sluicing conditions ( $M = 6.2$ ) and ( $M = 5.8$ ) and in non-elliptical conditions ( $M = 5.5$ ) and ( $M = 4.7$ ).

As in the previous experiments, raw ratings were z-score transformed prior to the analysis. A linear mixed-effects model was fitted with left-peripheral P, ellipsis, and *wh*-type as fixed factors and subject and item as random effects with random slopes and intercept. As indicated in Table 13, no significant main effect of any of the three factors was found. However, the results revealed a highly significant interaction between left-peripheral P and

**Table 12:** Experiment 3: Mean acceptability ratings by Condition (n = 74).

	Condition	Mean	SD
Condition 1	Left-peripheral P absent, sluicing, where	6.1471	1.55142
Condition 2	Left-peripheral P absent, sluicing, when	4.6230	2.23204
Condition 3	Left-peripheral P present, sluicing, where	6.2235	1.49726
Condition 4	Left-peripheral P present, sluicing, when	5.8081	1.79409
Condition 5	Left-peripheral P absent, non-elliptical, where	5.1318	2.08058
Condition 6	Left-peripheral P absent, non-elliptical, when	2.5339	1.97030
Condition 7	Left-peripheral P present, non-elliptical, where	5.5271	1.94142
Condition 8	Left-peripheral P present, non-elliptical, when	4.7201	2.21946



**Figure 5:** Experiment 3: Mean acceptability ratings by Condition (n = 74). Error bars represent the standard error of the mean (SEM).

**Table 13:** Experiment 3: Summary of linear mixed effects models; P-values estimated using the Satterthwaite approximation (\*\*p < .001).

	t-value	Pr(> t )
(Intercept)	3.929	9.86e-05***
Left-peripheral P	-1.426	0.15471
Ellipsis	0.643	0.52052
wh-type	-1.647	0.10084
Left-peripheral P * ellipsis	-0.922	0.35769
Left-peripheral P * wh-type	1.419	0.15700
Ellipsis * wh-type	-4.483	1.07e-05***
Left-peripheral P * ellipsis * wh-type	2.758	0.00646**

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

the *wh*-type ( $t = -4.483, p = 1.07e-05$ ). This reflects the fact that elliptical and non-elliptical conditions without left-peripheral prepositions are much more acceptable with *where* than with *when*. The results also revealed a significant three-way interaction ( $t = 2.758, p = 0.00646$ ). This is due to the improvement of the ratings specifically for *when* in the OPUS condition. No comparable effect is present for *where*, for which both elliptical conditions are highly acceptable ( $M = 6.1$  and  $M = 6.2$ , respectively). Indeed, these two values for *where* are not significantly different from each other.

### 5.3 Discussion

The results show that in non-elliptical structures without pied-piping *when* and *where* show clearly distinct behaviours, in line with our discussion in section 2. This allows us to test the structural hypothesis according to which the acceptability of OPUS should be modu-

lated by the availability of a non-elliptical source. The expectation is clearly borne out, furnishing a powerful argument for the structural approach. On the basis of the results in the earlier experiments we expected that for *where* – the case for which there are grammatical pre-sluices with and without pied-piping of P – we would find no difference between OPUS condition and the condition with a PP remnant. Indeed, this expectation was borne out. For *when* on the other hand – the case for which there is a grammatical pre-sluice only in case the remnant is a PP – we found a significant and rather large degradation of the variant without the preposition. This seems to us to furnish a powerful argument for the structural approach.

While we acknowledge that acceptability judgment data bears on the question of grammaticality only indirectly (see Hofmeister et al. 2013), it is unlikely that the decrease in acceptability we found in the crucial OPUS condition with *when* can be explained in terms of general processing considerations. In particular, Hofmeister et al. (2013) used the improvement of judgments in the course of the experiment (learning) as evidence that the structure they were testing is not ungrammatical but instead difficult to process. They suggested that such learning in the course of an experiment characterizes processing effects as opposed to grammatical effects more generally. We found no comparable improvement ( $p = .286$ ) over the course of the experiment (mean judgment for the crucial Left-peripheral P absent -ellipsis-*when* condition for the first half = 4.53 and for the second half = 4.74).<sup>29</sup>

Another possible objection to our interpretation of the decreased acceptability of the crucial condition might try to relate the effect to a hypothetical difficulty participants encounter in contextualizing the examples. We do not think that such an objection is valid, since it should equally affect the condition with a left-peripheral preposition (and presumably the locative conditions as well).

Overall, the results strengthen the case for a grammatical explanation. The results cast further doubt on the applicability of Nykiel's model. Recall that her model predicted no difference between the *when* and the *where* conditions.

We mentioned in the section 2 footnote 7 that Saudi Arabic allows in-situ *wh*-questions in addition to the three strategies (movement, resumption, and clefting) that we have discussed in connection to experiments 1 and 2. We have shown that the results of experiments 1 and 2 are compatible with analyses of sluicing that place the *wh*-phrase in Spec, CP accompanied by elision of IP. The results of experiments 1 and 2 are also compatible with an in-situ analysis of sluicing (see Abe 2015), according to which the *wh*-phrase is pronounced in its base position rather than in Spec, CP accompanied by non-constituent ellipsis. An important distinction between the movement and in-situ approach, both of which assume structure in the ellipsis site, lies in the extent to which they derive Ross's (1969) generalization concerning pied-piping: only those *wh*-phrases can be sluicing remnants that can also undergo *wh*-movement. In-situ analyses of sluicing typically do not derive the pied-piping generalization and therefore do not derive Merchant's P-stranding generalization either; the P-stranding generalization is a particular and stronger version of the pied-piping generalization. In-situ analyses of sluicing obviously have an easy time with the results of our experiments 1 and 2. However, experiment 3 crucially shows the effect of the pied-piping generalization. Since an in-situ analysis would not lead to the expectation that OPUS with *when* is degraded. Our results therefore also argue against in-situ analyses of sluicing.

<sup>29</sup> Although we found a significant difference ( $p > 0.00$ ) in reaction times in condition 1 'Left-peripheral P absent, sluicing, *where*' ( $M = 4935.61$  ms) and condition 2 'Left-peripheral P absent, sluicing, *when*' ( $M = 6069.65$  ms); we believe that this difference might be attributed to the extended search for a grammatical pre-sluice in the latter case.



The second striking result of the experiment was that we found an improvement in both elliptical conditions with *when*. The improvement in the OPUS condition with *when* was more marked than in the condition with a left-peripheral preposition. We do not understand what causes this improvement, which is unexpected from the perspective of our grammatical explanation. Further work will be needed to shed light on the nature of this improvement. For one possible approach, see Molimpakis (2019).

We will discuss how these results fit into the emerging cross-linguistic picture in the next section.

## 6 Conclusion

To summarize, we conducted three acceptability judgment studies on OPUS in Saudi Arabic. They were driven by two main ideas: First, the ellipsis site contains silent syntactic structure. Second, the syntactic structure at the ellipsis site, the pre-sluice, may but need not contain a resumptive pronoun rather than a gap. The results overall support these ideas.

We showed that OPUS is acceptable in Saudi Arabic (all three experiments). Thus, Saudi Arabic behaves in agreement with what has been reported for other Arabic varieties but in conflict with Merchant's (2001) P-stranding generalization. We have also shown that OPUS is acceptable not only in merger type sluicing (experiments 2 and 3) but also in contrast sluicing (experiments 1 and 2), which is problematic for approaches like Algryani (2012); Leung (2014b); Albukhari (2016), where clefts are assumed to be the sole pre-sluice giving rise to OPUS in Arabic. Experiment 2 probed whether the use of a resumptive pronoun in non-elliptical conditions leads to a degradation in the judgments, which should, under our hypothesis, correlate with a similar degradation in contrastive OPUS structures, where, it will be recalled, resumptive pronouns are forced. However, we did not find a degradation coming from the use of resumptive pronouns – either in elliptical or non-elliptical structures. Experiment 3 showed that the judgments on OPUS depend on the acceptability of a grammatical pre-sluice in the ellipsis site. This was in line with structural expectations.

Together, we take these three experiments as strongly supporting an approach to sluicing that assumes a silent pre-sluice at the ellipsis site and which allows questions with resumptives as pre-sluices. We do not see how to square this finding with a non-structural approach for sluicing.

The results are moreover problematic for Nykiel's model, because the effects expected under her account did not reliably influence the results in our experiments. While the first experiment did show an effect of the informativity of the correlate, this size of the effect was too small to exclude a false positive. Indeed, the effect failed to be reproduced in the follow up study mentioned in footnote 18. Furthermore, the effect of structural persistence predicted by Nykiel's model in experiment 2 failed to materialize. Finally, in experiment 3, where Nykiel's model predicts a null result, we found a robust effect of *wh*-type.

While experiment 3 showed a degradation in OPUS conditions with *when* compared to OPUS conditions with *where*, there was an additional interaction with ellipsis here: the elliptical condition, while degraded, is substantially improved compared to its non-elliptical counterpart. How does Saudi Arabic fit into the cross-linguistics picture? The results of experiment 3 are reminiscent of the situation reported in Molimpakis (2019) for Greek. Recall that in Molimpakis's experiment there were no plausible acceptable pre-sluices for the OPUS conditions. While Molimpakis found a degradation, she also found the strong ameliorating influence of ellipsis. Similarly, Nykiel (2013) argues that OPUS in Polish (contra Szczegielniak 2008) lacks a grammatical pre-sluice. And again examples of OPUS are judged worse than sluices with PP remnants but at the same time strikingly more acceptable than overt P-stranding. This is the behaviour of OPUS with *when* in our experiment 3. On the other hand, we found that when there is a grammatical pre-sluice

(experiments 1, 2, and *where* in experiment 3), there is no penalty from the lack of a left-peripheral preposition at all. Studies involving OPUS where a grammatical pre-sluice is available have not been conducted for Greek and Polish, so we do not know how such examples would behave. The findings from Saudi Arabic suggest that the OPUS penalty in Molimpakis's and Nykiel's experiments should be interpreted as the signal of the lack of a grammatical pre-sluice, that is, as a signal that the sentences are ungrammatical. The improvement compared to the non-elliptical versions, under this view, must be attributed to other, possibly extra-grammatical factors. We must leave the question of what those factors might be unanswered.

The experiments have shown that resumption is compatible in Saudi Arabic non-elliptical questions with all nominal *wh*-phrases and with *where* but not with *when*. This finding contrasts with what has been reported for other Arabic dialects (Aoun et al. 2010), where resumptive pronouns have a substantially more limited distribution. Experiment 2 further showed that resumption in cases where it is optional does not have a negative effect on acceptability. It seems to us that this finding should be of some interest for debates on resumption (Rizzi 1990; Shlonsky 1992; Aoun 2000; Aoun et al. 2001).

Given the results on OPUS in Saudi Arabic, it may be worth revisiting the analysis of OPUS in other Arabic dialects. As mentioned above, the literature has never brought contrastive sluices to bear on the question of the possible pre-sluice and has, in some cases, conflated the cleft and the resumptive strategy for question formation. We hope that our focus on contrast sluices may provide an impulse for comparable work on other Arabic dialects. We expect that existing variation in the distribution of resumptive pronouns across Arabic dialects should be reflected in the acceptability patterns of OPUS, which would further strengthen the core thesis of this paper.

Overall, we hope that the current results can help overcome the current theoretical impasse in the literature on OPUS. Our results suggest that there is structure at the ellipsis site but that it need not be isomorphic to the antecedent. Generalizing the results from Saudi Arabic, we would expect that for other languages and structures we should find the following type of pattern: OPUS should be fully acceptable just in case a well-formed and semantically appropriate pre-sluice is available. OPUS should be degraded when no well-formed and semantically appropriate pre-sluice is available. In the case where no pre-sluice is available, the extent and cause of any amelioration under ellipsis needs to be further studied.

## Abbreviation

1 = first person; 2 = second person; 3 = third person; F = Feminine; M = Masculine; SG = singular; PL = plural; NEG = negation; OPUS = Ostensible P-stranding Under Sluicing or Omission of Preposition Under Sluicing.

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## Competing Interests

The authors have no competing interests to declare.

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