Boštjan Dvořák and Uli Sauerland (2006)
“The Semantics of the Slovenian Dual”

1. Introduction and Main Claim

(1) Main Claim

• The number category ‘dual’ in (Central) Slovenian receives an interesting treatment within Sauerland’s general ‘presuppositional’ semantics for number.

• Such a presuppositional semantics for dual might explain certain restrictions on the use of the dual in Slovenian.

(2) The Dual in (Central) Slovenian
The dual is a robust, widely used morphological category in (Central) Slovenian. (In the south, it’s being lost due to contact with Croatian).

a. Obligatory Use with Personal Pronouns
The plural in (ii) is only acceptable if the referents are at least three in number.

(i) Kaj sta delala včeraj zevcev?
What be.DUAL work.DUAL yesterday evening

(ii) Kaj je delal včeraj zevcev?
What bePL work.PL yesterday evening

b. Obligatory Use with Anaphora to Duals
If a pronoun refers to a pair of entities, the dual must be used.

(i) Question: Do you remember Peter and Vera?

(ii) Answer: Svededa ju
of.course them.DUAL
Of course I do.

* Svededa jih
of.course them.PLURAL

c. Obligatory Use with Conjoined Singulars
A conjunction of two singular NPs requires dual agreement on the verb.

To sta / *ste Peter in Vera
that is.DUAL / is.PL Peter and Vera
That is Peter and Vera.
The Puzzle: Restrictions on the Use of the Dual (Dvořák & Sauerland 2006)

Despite the obligatory uses of the dual above, the dual cannot be used with NPs that refer to body parts or family members, even if those naturally occur in pairs...

a. No Use of Dual with Body Part Terms

\[
\begin{align*}
\text{Umij si roke} & / \ast \text{ roki!} \\
\text{wash REFL hand.PL hand.DL}
\end{align*}
\]

However, dual is again required if either (i) an explicit quantifier or modifier indicating duality is used (b), or (ii) explicit reference is made to the duality of the referent.

b. Dual Required with Explicit Quantifier

\[
\begin{align*}
\text{(i)} \quad \text{Umij si obe roki} & / \ast \text{ roke} \\
\text{wash REFL both hand.DL hand.PL}
\end{align*}
\]

\(Wash\ both\ your\ hands.\)

\[
\begin{align*}
\text{(ii)} \quad \text{Kupil sem dve knigi} & / \ast \text{ knige} \\
\text{bought I.am two book.DL book.PL}
\end{align*}
\]

\(I\ bought\ two\ books.\)

c. Dual Required with Explicit Reference to Duality (sic)

\[
\begin{align*}
\text{(i)} \quad \text{This is a B737… Motorje} & / \ast \text{ Motorja ima na krilih.} \\
\text{engine.PL engine.DL have on wings}
\end{align*}
\]

\(This\ is\ a\ B737.\ Its\ engines\ are\ on\ its\ wings.\)

\[
\begin{align*}
\text{(ii)} \quad \text{This is a B737…Oba motorja} & / \ast \text{ motorje ima na krilih.} \\
\text{both engine.DL engine.PL have on wings}
\end{align*}
\]

\(This\ is\ a\ B737.\ Both\ its\ engines\ are\ on\ its\ wings.\)

Commentary

- It isn’t clear that the condition in (c) is distinct from that in (b). In my discussion, then, I will not distinguish them.

- Dvořák and Sauerland describe the restriction in (a) as if its about a specific class of nouns (body parts / family members). However, the facts in (b) and (c) suggest that it’s a fact about all nouns in Slovenian. In my discussion, I will assume it is.

- Given the obligatory presence of dual in (2) and its obligatory absence in (3a), it’s clear that Slovenian ‘dual’ isn’t ‘facultative’ in the sense used by Corbett (2000)… … which raises the question of whether any numbers are truly ‘facultative’ in that sense… (the appearance that there are might just be due to poor descriptions)
2. Two Rejected Analyses

In light of the data above, Dvořák and Sauerland consider and then reject two particular hypotheses regarding the category ‘dual’ in Slovenian.

(5) **Hypothesis 1**
The dual is simply some form of ‘agreement’ with the numeral *two* and/or the modifier *both*. *This would perhaps explain the facts in (3).*

(6) **Problems**

a. **Dual in Conjunctions and Pronouns**

As shown in (2), the dual is obligatory with pronouns and conjunctions that refer to pairs, *without there being an overt numeral like ‘two’ or modifier like ‘both’*

b. **Dual Licensed by Numerals Inside of Complements and Relative Clauses**

Consider the examples below, where dual on the NP seems to be licensed.

(i) [Voznik a [dveh avtomobilov]] sta se kregala.  
drivers.DL two cars.DL be.DL arguing.DL  
*The drivers of those two cars are arguing.*

(ii) [Moz a [ki sta porocena z Mojco in z Ano]]  
men.DL who be.DL married.DL with M. and with Ano  
sta srecna.  
be.DL happy  
*The men who are married to Mojca and Ana are happy.*

Here, there is no direct modification of the NP by *two* or *both*. Rather, the ‘licensing’ expressions are buried within (i) NP complements, or (ii) relative clauses. Thus, a syntactic agreement account seems unlikely for these examples.

The facts in (6b) also greatly complicate any ‘surface generalization’ regarding the distribution of dual on Slovenian NPs, and lead Dvořák and Sauerland to make the rather vague generalization below:

(7) **Generalization (Dvořák and Sauerland 2006: 103)**

In Slovenian, the dual is obligatory with pronouns and conjunctions making referring to pairs. If dual appears on an NP, then ‘it generally needs to be overtly explained by a concrete numeral’…
Hypothesis 2:
The meaning of ‘dual’ is essentially that of *two* in English. It combines with an NP to create an <et> predicate that is true of an entity x iff there are two atoms y,z such that:
(i) \( x = y+z \)
(ii) \([\text{NP}](y) = T \) and \([\text{NP}](z) = T \)

Problems

a. Dual in Conjunctions and Pronouns
Dyadic number is also possible (obligatory) with pronouns and conjunctions. However, the semantics in (8) wouldn’t obviously extend to those.

b. Constraints on the Use of the Dual
The semantics in (8) wouldn’t clearly account for the data in (3); rather, (8) would seem to predict that the dual would have much the same use and distribution as overt numerals like *two*.

Another key problem is raised by sentences like those in (6b)...
*To see this, however, we should consider a parallel problem for the analysis of plural in English*

Puzzle for the Semantics of Plural in English

a. Key Observation: Sentences (i) and (ii) imply (iii).
(i) Dave is the father of Mary.
(ii) Ron is the father of Sue.
(iii) Dave and Ron are the fathers of Mary and Sue.

b. The Puzzle
What is the syntactic representation of (10a(iii))? If we were to assume the semantics for ‘father’ in (i) below, it couldn’t be the LF in (ii)...

* • Since Mary and Sue don’t share a single father, if \([\text{Mary and Sue}]\) were complement to \([\text{father}]\), then the resulting predicate in (iii) would be true of no entity.
  • Consequently, the pluralization of that predicate (iv) would be true of nothing
  • Consequently, the DP in (ii) would incur a presupposition failure

(i) \([\text{father}]\) = \([ \lambda x : \lambda y : y \text{ is the father of } x ] \)
(ii) \(\ldots [ \text{ the } [ * [ \text{ father of Mary and Sue } ] ] \ldots ] \)
(iii) \([ \text{ father of Mary and Sue }]\) = \(\emptyset\)
(iv) \([ [ * [ \text{ father of Mary and Sue } ] ] ]\) = \(\emptyset\)
(11) **A Solution: Cumulativity on “Father”**

Given the assumptions in (10ai) and (10aii), the extension of “father” would be as in (11a) below:

a. \[ [[\text{father}]] = \{\langle\text{Mary},\text{Dave}\rangle, \langle\text{Sue}, \text{Ron}\rangle \} \]

Thus, if we were to assume the ‘generalized *-operator’ of Krifka (1999), then the semantics of pluralized “father” would be as in (11b) below:

b. \[ [[\ast \text{father}]] = \{\langle\text{Mary},\text{Dave}\rangle, \langle\text{Sue}, \text{Ron}\rangle, \langle\text{Mary+Sue}, \text{Dave+Ron}\rangle \} \]

Thus, the DP in (c) would be interpreted as in follows.

c. \[ [[\text{the } [ [\ast \text{father }] \text{ of Mary and Sue }]]]] = \]
\[ [[[\text{the}]] \text{ (} [[[\ast \text{father}]](\text{Mary+Sue}) \text{ })] = \]
\[ [[[\text{the}]] \text{ (} \{\text{Dave+Ron}\} \text{ }) = \text{Dave+Ron} \]

Thus, the inference in (10a) would be licensed.

(12) **The Solution Within Sauerland (2003)**

Sauerland (2003) shares with Krifka (1999) the assumption that \[ [[\text{father}]] \] has the extension in (12a) below:

a. \[ [[\text{father}]] = *[[\text{father}]] = *[\lambda x: \lambda y: y \text{ is the father of } x] \]

Consequently, the LF in (b) would be straightforwardly interpreted as in (b):

b. \[ [[\text{the father of Mary and Sue}]] = \text{Dave+Ron} \]

Thus, the LF in (c) would be straightforwardly interpreted as in (c):

c. \[ [[\varphi_{PLUR} \text{ [ the fathers of Mary and Sue }]]] = \text{Dave+Ron} \]

Moreover, the LF in (d) would not be interpretable, due to the fact that (b) is not an atom.

d. \[ [[\varphi_{SING} \text{ [ the father of Mary and Sue }]]] = \text{undefined} \]

Thus, we obtain the result that the inference in (10a) is licensed (and requires plural number on the N *father*).
With this as background, consider again the facts in (13) below.

(13)  
**Licensing of Dual By Numeral in NP Complement / Adjunct**

a.  
[ Voznik a [ dveh avtomobilov ] ]  
\[ \text{drivers.DL two cars.DL be.DL arguing.DL} \]  
The drivers of those two cars are arguing.

b.  
[ Moz a [ ki sta porocena z Mojco in z Ano ] ]  
\[ \text{men.DL who be.DL married.DL with M. and with Ano} \]  
sta srecna.
\[ \text{be.DL happy} \]  
The men who are married to Mojca and Ana are happy.

(14)  
**The Puzzle**

- What is the LF of (13a) or (13b)? If the dual had the ‘operator’ semantics in (8), it couldn’t be as in (a) below.

a.  
**Not Possible LFs (Given the Semantics in (8))**

(i)  
[ DUAL [ driver [ of the two cars ] ] ] …

(ii)  

- Again, the problem is that the meaning of (13) allows that there is no (atomic) driver of the two cars – since each car has a separate driver – and there is no (atomic) man who married Mojca and Ana…
  
  … but the LFs in (14a) would require that there be such atomic men and drivers…

- Moreover, if dual had the ‘operator’ semantics in (8), the LF of (14ai) couldn’t be as in (b) either, since (8) requires the argument of DUAL to be of type <et> (not <eet>)

b.  
**Not Possible LF (Given the Semantics of (8))**

[ [ DUAL driver ] [ of the two cars ] ]

(15)  
**Conclusion:**

- The ‘operator’ semantics in (8) couldn’t be successfully applied to cases like (13a).

- We should try to develop a semantics for dual that could apply to (13a)
(16) **Sidenote: The Operator Semantics from Tuesday**

Recall the ‘operator’ semantics for DUAL that we considered in our discussion of Corbett (2000):

a. **An Alternate Operator Semantics for Dual**

\[
\text{DUAL}(S) = \text{The smallest set such that}
\]

(i) \(S \subseteq \text{DUAL}(S)\)

(ii) If \(x, y \in S\), then \(x + y \in \text{DUAL}(S)\)

Note that given our generalization of the ‘+’ operator, this dual operator could apply to an <eet> predicate like \textit{driver}. Moreover, it would give us the right result in (13a)!

b. **Semantics of Driver**

\[
[[\text{driver}]] = \{ \langle \text{Car1}, \text{Bill} \rangle, \langle \text{Car2}, \text{Tom} \rangle \}
\]

c. **Semantics of [ DUAL driver ]**

\[
[[\text{DUAL driver}]] = \{ \langle \text{Car1}, \text{Bill} \rangle, \langle \text{Car2}, \text{Tom} \rangle, \langle \text{Car1+Car2}, \text{Bill+Tom} \rangle \}
\]

Given the result in (c), it would follow that the LF in (d) would be interpreted as follows:

d. **Semantics of Key LF**

\[
[[\text{the [ [ DUAL driver ] [ of Car1 and Car2 ] ]}]] =
\]

\[
[[\text{the}]] ( [[\text{DUAL driver}]] (\text{Car1+Car2}) ) =
\]

\[
[[\text{the}]] ( \{ \text{Bill+Tom} \} ) = \text{Bill and Tom}
\]

Thus, under the semantics in (a), we do get a properly interpreted LF for the key DP in (13a)!

---

3. **The Proposed Analysis: A Presuppositional Semantics for ‘Dual’**

Dvořák and Sauerland (2006) develop an analysis of the Slovenian dual with the general contours of Sauerland’s (2003) treatment of plural and singular in English

(17) **Key Syntactic Assumption**

Number is only interpreted on \(\varphi\)Ps, which take DPs and ConjPs as complement. (Number on NPs is merely agreement with the c-commanding \(\varphi\)-head)
(18) **Key Semantic Assumption, Part 1: Presuppositional Semantics for Number**

a. \[[ \text{PLURAL} ]\] = \[ \lambda x : x \]

b. \[[ \text{SINGULAR} ]\] = \[ \lambda x. x \in D : x \]

c. \[[ \text{DUAL} ]\] = \[ \lambda x . | x | \leq 2 : x \]

_Dual is an identity function on pluralities whose cardinality is at most two._

(19) **Key Semantic Assumption, Part 2: Maximize Presupposition**

“Of two lexical items, that lead to the same truth conditions in all cases where both their presuppositions are satisfied, the item with the stronger presuppositions must be used.”

Given our familiarity with Sauerland’s (2003) account of plural vs. singular in English, it’s rather clear that the assumptions above capture the data in (2).

(20) **Dual in Pronouns**

Given the principle of ‘Maximize Presuppositions’, it’s clear that if a pronoun ever refers to a pair of entities, then DUAL number has to be used.

- Suppose that \(g(1) = \text{Dave} + \text{Bill}\). Consequently, the LF in (a) will not be interpretable.

a. \[ \varphi_{\text{SING}} [ \text{pro}_1 ] \]

- However, the LF in (b) will be interpretable.

b. \[ \varphi_{\text{DUAL}} [ \text{pro}_1 ] \]

- The LF in (c) will also be interpretable. However, (19) requires that (b) be used.

c. \[ \varphi_{\text{PLUR}} [ \text{pro}_1 ] \]

(21) **Dual in Conjunctions**

Via similar, familiar reasoning, we can see how the account would predict that conjunctions referring to a pair of entities must also appear with DUAL (rather than PLURAL) number...
Thus, the presuppositional analysis of dual can account for the facts in (2)...

But those facts are the easy ones... what about the facts in (3) and (6b)?...

(22) **Case 1: NPs Modified by Two (or Both)**

- For our purposes we’ll limit attention to NPs modified by *two* (it is assumed that the account will extend straightforwardly to NPs modified by *both*).

- First, we wish to understand the facts in (a) below.

     I bought two books.

- Following familiar type-theoretic reasoning, the LF of (a) would need to be as in (b).

  b. [ two books ] [ 2 [ I bought [ \( \varphi_{\text{DUAL}} t_2 \) ] ] ]

- Given familiar reasoning, the interpretation of (b) would be as in (c).

  c. There’s a plurality of books y such that \(|y| = 2\) and \([\lambda x. \ | x | \leq 2 : \text{I bought} \ x](y)\)

- Clearly, (c) is true exactly when there is a pair of books y such that I bought y. Thus, (b) would seem to be assigned the correct T-conditions for (a).

- But what rules out the LF structure in (d)?

  d. [ two books ] [ 2 [ I bought [ \( \varphi_{\text{PLURAL}} t_2 \) ] ] ]

- It’s not clear from their exposition (pp. 108-109) what they believe rules out (22d), but it seems like it might follow from the condition in (e), taken from Sauerland *et al.* (2005).

  e. “Maximize Presupposition applies to the scope of an existential if this strengthens the entire utterance.” (Sauerland *et al* 2005: 423)

- Given (e), the LF in (d) will receive the ‘strengthened’ interpretation in (f), which would clearly not be satisfiable.

  f. There’s a plurality of books y such that \(|y| = 2\) and \([\lambda x. \ | x | > 2 : \text{I bought} \ x](y)\)

So we understand why dual is allowed / required by NPs modified by ‘two’ or ‘both’...

But, again, that fact was not the really puzzling one...
Case 2: NPs Containing *Two* in their Complements (or Adjuncts)

- Let’s now try to understand the facts in (a) below:

  a. \[ \{ Voznik a \} [ dveh avtomob ilov ] ] sta se kregal a.

     drivers.DL two cars.DL be.DL arguing.DL

     The drivers of those two cars are arguing.

- Recall that Sauerland (2003) would assume that the LF of the definite DP in (a) would be as in (b)

  b. \[ \{ \varphi_{DUAL} \} [ \{ \text{drive r.DUAL} \} of the two cars ] \ldots ] \]

- Moreover, since Sauerland (2003) would assume that the NP *driver* is cumulative, the semantics would predict that the DP *the driver of the two cars* would be as in (c), where Dave is the driver of one car, and Bill is the driver of the other.

  c. \[ [[ \text{the driver of the two cars } ]] = \text{Dave+Bill} \]

- Finally, since ‘Dave+Bill’ would satisfy the presuppositions of ‘\( \varphi_{DUAL} \)’ we predict that the structure in (23a) is indeed interpretable.

  But, again, the fact in (23a) is not a very puzzling one…

  What about the key fact in (3a), that dual is *not* allowed with a simple unmodified NP?

Case 3: Unmodified NPs appearing with Dual

- Finally, let’s try to understand the key facts in (a) below:

  a. Kupil sem * knigi / knige

     bought I.am book.DL book.PL

     I bought two books.

- Following familiar type-theoretic reasoning, the LF of (a) would need to be as in (b)

  b. \[ \{ (\text{some books} ) \} [ 2 [ I \text{ bought } \{ \varphi_{DUAL} t_2 \} ] ] \]

- Given familiar reasoning, the interpretation of (b) would be as in (c)

  c. There’s a plurality of books y such that \[ \lambda x. | x | \leq 2 : I \text{ bought } x ](y) \]

- Dvořák and Sauerland claim that these truth-conditions require that *all* pluralities of books contain at most two members – and thus (a) cannot be given coherent T-conditions…
Some Major Problems

a. **Problem 1:**
The T-conditions in (24c) just don’t require that all pluralities have two members, only that at least one of them does…

b. **Problem 2:**
Moreover, presuppositions in general just don’t project in the way they assume in this account.
   o The LF in (i) does not have the ‘global’ presupposition in (ii).

   (i) [ some boys ] [ 2 [ t2 rode their2 bicycles ] ]
   (ii) All boys have bicycles.

c. **Problem 3:**
Moreover, the account proposed in (24) will not extend to examples like the one in (3a), repeated below.

   (i) Umij si roke / * roki!
wash REFL hand.PL hand.DL

   Here, the problem is that the DP in question is definite, and so the account in (24) – based upon the way presuppositions project in quantificational statements – wouldn’t apply here…

d. **Problem 4:**
Finally, the fact in (24a) seems to be specific to the Slovenian dual. However, their account would seek to derive it from a semantics for the dual that would presumably apply also the dual of languages like (e.g.) Sanskrit, where those facts do not hold…

General Summary / Assessment

- The presuppositional analysis of the Slovenian dual is able to successfully predict the following facts:
  o The dual is required with pronouns and conjunctions referring to pairs.
  o The dual is required with NPs directly modified by two and both
  o The dual is required in cases like the drivers of the two cars.

- But, these facts don’t seem very puzzling, and could easily be captured by the ‘operator’ analysis of dual in (16) [modulo standard problems with pronouns]

- Unfortunately, the presupposition analysis does not seem to predict the following fact, which is the most problematic for theories of the dual (in Slovenian):
  o The dual is not (generally) permitted with NPs that are ‘bare’ / ‘unmodified’