Chapter 6

Analysis and Conclusions

6.0 Introduction

The last chapter concluded with a discussion of this dissertation's first three hypotheses in light of the results obtained here. The fourth, and final, hypothesis is repeated again in H4:

> (H4) The developmental path taken by L2 learners may be characterized as the interaction of discrete discoursal and syntactic constraints, and this interaction will confirm the operation of the Constraint Demotion Algorithm of Tesar and Smolensky (2000).

This chapter argues that this hypothesis is confirmed by the results of this study and presents the analysis used to support this claim.

The results of this study show that learners begin to drop subjects indiscriminately in the early stages of acquisition. At the next stage, learners appear to recognize that the target grammar requires the dropping of topics, not subjects. As sensitivity to discoursal conditions increases, learners' selection of inversion also increases. Although early learners do not choose inversion as frequently as near-native and native speakers, even among these early learners the choice to invert is made more frequently when the discourse conditions call for the focusing of the subject. Unlike Italian, Spanish inversion in focused cases appears to involve a greater degree of optionality, in contrast to non-focused cases, where inversion simply does not occur. Although there is some

evidence that early learners may accept *that-trace* sequences, early learners only accept *that-trace* about half the time; native speakers consistently, obligatorily choose *that-trace* sequences. Learners eventually identify the discourse conditions related to the dropping of subjects, inversion, and *that-trace.* These are the facts for which an analysis of these grammatical properties must give an account.

In attempting to account for these facts, the analysis here will assume that the same universal constraints provided by UG are present in both English and Spanish, but that these constraints are ranked differently in these two languages. Acquisition occurs when learners detect the differences between the constraint rankings of the L1 and L2 and use input from the target language to recursively restructure their grammars to more closely match the grammar of the input. Since some aspects of the input may be more salient than others, not all differences may be detected simultaneously and acquisition may involve several rerankings. In the initial learning state, a fully hierarchized representation of the L1 is used to interpret target language data. Since the L1 constraint rankings quickly fail to adequately handle L2 input, Constraint Demotion is triggered and learning begins to take place.

Given this set of assumptions, the analysis in this chapter argues that the developmental stages in the acquisition of null subjects, inversion, and *that-trace* can be understood as an interaction between the syntactic and discoursal constraints given in Figures 6.1–6.2 (repeated from Figures 1.1–1.2 in Chapter 1):

Figure 6.1 Syntactic constraints

a. SUBJECT (SUBJ): The highest A-specifier in an extended projection must be filled. Failed when a clause lacks a subject in the canonical position. (Grimshaw 1995)
b. PARSE: Parse input constituents. Failed when input elements are not overtly parsed in the output.
c. FAITH[SUB]: The output value of [SUB] (for 'subordination') must be the same as the input value. (Baković 1997)
d. T-LEX-GOV: A trace is lexically governed. (Grimshaw 1997)

Figure 6.2 Discoursal constraints

a. ALIGNFOCUS-RIGHT (AF-RT): Align the left edge of focus constituents with the right edge of a maximal projection. Failed by non-aligned foci. (Grimshaw and Samek-Lodovici 1995)
b. DROPTOPIC (DROPT): Leave arguments coreferent with the topic structurally unrealized. Failed by overt constituents which are coreferential with the topic. (Grimshaw and Samek-Lodovici 1995)

The classification of constraints as 'discoursal' or 'syntactic' is based upon whether the constraint affects the realization of units within clauses, in which case it is considered syntactic, or whether it affects larger structures or ordering of information beyond the clause, in which case it is considered discoursal. SUBJECT, PARSE, FAITH[SUB], and T-LEX-GOV relate to the realization of constituents within a clause, determining the correct set of syntactic properties for a language; therefore, these constraints are here considered syntactic. Among these, PARSE and FAITH[SUB] belong to the same family of 'faithfulness' constraints, constraints that require the input and the output of the grammar to be identical.

In contrast, ALIGNFOCUS-RIGHT and DROPTOPIC clearly relate to the ordering or realization of information based on extra-clausal information. Information packaging requirements are more fluid in a language, varying from utterance to utterance in

accordance with contextual considerations. Therefore, these constraints are considered discoursal.

The constraints in Figures 6.1–6.2 will be discussed further as they are used in the analysis, but the general observation is that the acquisition of Spanish by native speakers of English involves a dynamic re-ranking of constraints — most notably a demotion of certain syntactic constraints with respect to the discoursal constraints mentioned above.

Chapter 2 mentioned some possible types of alterations to a constraint hierarchy that might occur (from Hutton 1996). In terms of constraint demotion, those possibilities may be reduced to three: (1) demotion of one constraint (A) below another (B) where dominance relations are reversed (A»B→ B»A), (2) demotion of a constraint (B), previously tied or unranked in regard to another constraint, to a position where that constraint is now dominated ({A,B}→ A»B), or (3) demotion of a constraint (A), previously in a dominance relation in regard to another constraint, to a position where it is now tied with the constraint that formerly dominated it (A»B→ {A,B}). All three of these types of demotions are evidenced in the development of the grammatical properties analyzed here.

Section 6.1 begins with a more detailed description of how the mechanism of constraint demotion works in the special case of tied constraints ({A,B}) or stratified domination hierarchies ({A,B}»{C,D}), as is the case in some of the interactions here. Sections 6.2 proposes specific demotions involved in the realization of null subjects, both in the early stages of language acquisition, during which null subjects are overgeneralized, and in the later stages, in which learners discover that topics, not subjects, must be dropped. Section 6.3 considers the demotion process that moves

learners from a ranking where inversion is not possible, to one where it is possible but not obligatory. It is argued here that this demotion is connected to the acquisition of null subjects, suggesting one reason why null subjects and inversion often pattern together in pro-drop languages. Section 6.4 then takes up the issue of *that-trace* and provides two different analyses of the stages learners go through related to the complementizer: a first analysis which accounts well for the data, but involves uncertain modifications to the learning algorithm, and a second analysis which better honors the integrity of the learning algorithm but involves an expanded definition of input. Section 6.5 provides a brief summary of the analysis, pulling all the demotions involved in the acquisition of these properties together into one figure. Finally, Section 6.6 concludes the dissertation by summarizing what has been learned, to what degree this account of constraint demotion improves upon parameter-setting models, and how the findings suggest further lines of research in SLA.

6.1 Constraint demotion in stratified domination hierarchies

The normal operation of constraint demotion contrasts two constraints and changes the dominance relationship between them such that A»B becomes B»A; however, constraint demotion is also able to produce cases in which moving one constraint does not place it below another, creating the possibility of ties between constraints. This section will show how this result is obtained and why there is good reason to believe that certain constraints are either unranked in relation to each other (A,B), or if they are in a tie, they have two separate but equal rankings (i.e. A»B and B»A are equally valued).[1]

Tesar and Smolensky (2000) provide for the possibility of constraint demotion in the case of nonranked constraints by arguing that their learning algorithm operates within the space of stratified hierarchies, represented in Figure 6.3:

Figure 6.3 Stratified domination hierarchy (Tesar and Smolensky 2000:37)

$\{C_1, C_2, ..., C_3\} \gg \{C_4, C_5, ..., C_6\} \gg ... \gg \{C_7, C_8, ..., C_9\}$

The idea here is that although constraints of each stratum are not ranked with respect to each other, each of the constraints C_1, C_2, and C_3 dominate those of the next stratum and subsequent strata.[2]

In this chapter, following standard practice, commas between constraints indicate this nonranking, and the » symbol indicates a dominance relationship. In the tableaux in this chapter, also following standard practice, nonranking between constraints will be indicated by dotted lines; whereas, constraints that are in a dominance relationship to one another will be indicated by solid lines. Cells to the right of fatal violations are shaded to show that those constraints are irrelevant to the evaluation of candidates, since the candidate has already been eliminated by the fatal violation. These conventions are illustrated in Tableau 6.1 (adapted from Tesar and Smolensky 2000:38):

Tableau 6.1 Stratified hierarchy $C_3 \gg \{C_4, C_5\} \gg C_6$

	C_3	C_4	C_5	C_6
candidate A	*!		*	
candidate B			*	*!
Kcandidate C		*		
candidate D			**!	

The optimal candidate in Tableau 6.1 is candidate C. A single violation of either of Constraint 4 or Constraint 5 would not be sufficient in this tableau to disqualify the candidate from further consideration. Candidate A fails because it violates the highest ranking constraint here. Candidate B fails because it not only violates a constraint in the second stratum but also violates an additional constraint in the next stratum. Finally, candidate D fails because multiple violations within the same stratum are worse than a single violation.

Constraint demotion, which operates through a pairwise comparison of candidates, may, therefore, affect a grammar in three ways. First, a comparison between Constraint 3 and Constraint 4 above may demote Constraint 3 from the first stratum to a position below the second stratum. This yields the possibility of a simple reversal of the dominance relationship (C_3 » {C_4, C_5} → {C_4, C_5} » C_3). Second, a comparison between Constraints 4 and 5 could require that Constraint 5 be demoted to the next stratum, where it is now dominated by Constraint 4, but on the same tier as Constraint 6. This yields the possibility of moving from a position of nonranking to a new dominance relationship that is shared with another constraint ({C_4, C_5} » C_6 → C_4 » {C_5, C_6}). Finally, a comparison of Constraint 5 and Constraint 6 could require that Constraint 5 be ranked below Constraint 6. This is again a simple reversal of dominance, but differs from the earlier demotion (of C_3 below C_4) in that here there is a change in the original dominance relationship not only with respect to Constraint 5, but also with respect to Constraint 4 ({C_4, C_5} » C_6 → C_4 » C_6 » C_5). With the concept of stratified domination hierarchies in mind, we are now able to turn to the analysis of this chapter.

6.2 Null subjects

The analysis in this section begins with the assumption that beginning learners transfer their native language constraint hierarchy into their learning of the L2 (Schwartz and Sprouse 1996). It also assumes the initial constraint rankings for English motivated by Grimshaw and Samek-Lodovici (1995) and LaFond, Hayes, and Bhatt (2001) — that the English hierarchy is one in which a faithfulness constraint requiring the parsing of input constituents (PARSE) dominates both the syntactic constraint requiring clauses to have overt subjects (SUBJECT) and the discoursal constraint requiring the dropping of topic-connected subjects (DROPTOPIC). This hierarchy will always require overt subjects, regardless of discourse condition. In contrast, the ranking of the target (Spanish) hierarchy must be one that produces overt subjects only when they are non-topics.

The observation that intermediate learners indiscriminately drop subjects, not just topics, suggests a stage of acquisition in which learners recognizes that Spanish places a lesser priority than English on the parsing of input, but does not yet recognize the extent to which this difference in priorities is determined by discourse conditions. This section argues that the developmental path learners take in their acquisition of null subjects is characterized by the rankings in Figure 6.4 (below).

Figure 6.4 Rankings yielding non-null/null subjects

a. English ranking:	PARSE » SUBJECT » DROPTOPIC » ALIGNFOCUS-RT
b. Intermediate ranking:	SUBJECT » DROPTOPIC » {PARSE, ALIGNFOCUS-RT}
c. Spanish ranking:	DROPTOPIC » {PARSE, SUBJECT, ALIGNFOCUS-RT}

Although the rankings of PARSE, SUBJECT, and DROPTOPIC in Figure 6.4a follow the analyses of Grimshaw and Samek-Lodovici (1995) and the developmental account of null subjects of LaFond, Hayes, and Bhatt (2001), the current analysis' subsequent rerankings involve some differences from previous accounts. Whereas LaFond, Hayes, and Bhatt (2001) proposed that learners of Spanish first demote SUBJECT and later PARSE and that the final Spanish ranking is one in which PARSE still dominates SUBJECT, the analysis here demotes PARSE before SUBJECT and holds that the final Spanish ranking is one in which PARSE is on the same stratum as SUBJECT (and also ALIGNFOCUS-RIGHT).

The proposal of LaFond, Hayes, and Bhatt was motivated by the premise of Grimshaw and Samek-Lodovici (1995) that PARSE must dominate SUBJECT because the null candidate in Tableau 6.2, which leaves all input unparsed, would satisfy the SUBJECT constraint.

Tableau 6.2 PARSE and SUBJECT in Italian (adapted from Samek-Lodovici 1995:593)

Input <*cantare* (x) , x=topic, x=*lui*; T=pres perf>	DROPT	PARSE	SUBJ
K a. *ha cantato* ('has sung')		*	*
b. Ø		**!	

But this premise is only true if the radically null candidate does not violate SUBJECT, and it remains unclear why this should be so. The input in Tableau 6.2 has a subject, *lui*, and the null candidate fails to parse this subject. The assumption being made is that the definition of SUBJECT is such that a clause without one is violated, but if there is no clause there is no violation (Jane Grimshaw, personal communication). If no input material is parsed at all, there is no violation of SUBJECT, because there will be no clausal structure.

Nevertheless, to hold that PARSE must dominate SUBJECT because of the radically null candidate requires the assumption that null candidates involve not only leaving structural positions unfilled but, also, the removal of that structure altogether. This is problematic for those who would maintain that GEN uses input to produce candidate structures in keeping with X-bar Theory. Fortunately, there is no need to assume that PARSE must dominate SUBJECT in Italian (or Spanish), since assuming that the null parse also violates SUBJECT produces identical results.

Tableau 6.3 PARSE and SUBJECT in Italian reconsidered

Input <*cantare* (x) , x=topic, x=*lui*; T=pres perf>	DROPT	PARSE	SUBJ
K a. *ha cantato* ('has sung')		*	*
b. Ø		**	*(!)

In Tableau 6.3, the non-ranking of PARSE with regards to SUBJECT means that the radically null candidate will not be selected because it contains an additional violation not found in the winning candidate. Although the radically null parse is here shown with two violations (for the verb and its argument), another possibility is that leaving tense unparsed incurs a third violation, and this would also eliminate the null candidate, regardless of whether PARSE dominates SUBJECT or is positioned on the same tier as SUBJECT. If PARSE and SUBJECT are not ranked with respect to each other, any violations of either constraint that cause the total number of violations for one candidate to exceed another will be fatal. In the present example, two violations on the second tier in Tableau 6.3 are acceptable, but a third violation is fatal.

Although PARSE and SUBJECT do not appear to be ranked in Italian, there is some evidence that they are ranked in English in the order that LaFond, Hayes, and Bhatt

(2001) suggest. In English, PARSE and SUBJECT do not normally enter into competition with one another, but in those rare instances that they do, a violation of PARSE is worse than a violation of SUBJECT. For example, a sentence such as *He said 'I agree'*, may undergo a fronting operation that moves the lower sentence to the head of the matrix sentence. Such fronting does not necessarily violate PARSE or SUBJECT (6.1a); however, when elements are fronted in this way, subject inversion may occur (6.1b), resulting in a violation of SUBJECT, but not PARSE. Although such sentences are involve special discoursal contexts, there is a clear contrast between violating SUBJECT, as 6.1b does, and violating PARSE, as in 6.1c-e.

(6.1.) a. *'I agree' he said.*

b. *'I agree' said he.*

c. **'I agree' said.*

d. **Ø he said.*

e. **He said Ø.*

The difference between the candidates that violate SUBJECT and the candidate that violates PARSE is shown in Tableau 6.4:

Tableau 6.4 PARSE and SUBJECT in English

Input <*say* (x) , x=topic, x=*he*; y = '*I agree*' T=pst>	PARSE	SUBJ
K a. *'I agree' he said.*		
? b. *'I agree' said he.*		*
c. *'I agree' said.*	*!	*
d. *Ø he said.*	*!	
e. *He said Ø.*	*!	

Candidates in 6.4a and 6.4b show a gradient ranking. The favored structure in English is 6.4a, and this response violates neither PARSE nor SUBJECT. Although the 6.4b ought to be ungrammatical according to the grammar, apparently violation of SUBJECT is not enough in this discourse style to eliminate the candidate. Hence, candidates that violate SUBJECT, are sometimes allowed in English, but violation of PARSE generally proves fatal. This result is different than Spanish, where the competition between PARSE and SUBJECT no longer distinguishes candidates due to the fact that in Spanish both PARSE and SUBJECT are dominated by the higher ranked constraint, DROPTOPIC.[3] Based on these observations, the analysis in this dissertation assumes the same initial constraint ranking of PARSE and SUBJECT for English proposed by Grimshaw and Samek-Lodovici (1995) and LaFond, Hayes, and Bhatt (2001), but proposes that this constraint ranking is not preserved in Spanish, where PARSE and SUBJECT are positioned on the same stratum.[4]

If PARSE dominates SUBJECT in English but not in Spanish, and if PARSE and SUBJECT may terminate on the same stratum, the question then becomes which demotes first as learners acquire Spanish. The study of LaFond, Hayes, and Bhatt (2001) could not, based on their study of only null subjects, demonstrate any empirical reason why SUBJECT should demote before PARSE. By looking at a broader picture that includes inversion, it becomes clear that PARSE must first demote, because the demotion of SUBJECT below DROPTOPIC places SUBJECT on the same tier as ALIGNFOCUS-RIGHT. As will become clear in the next section, the demotion of SUBJECT to the same tier as ALIGNFOCUS-RIGHT creates the inversion effects found in Spanish, and since these effects do not surface until after the acquisition of null subjects, we can establish the order of demotion — PARSE demotes first, followed by the demotion of SUBJECT.

Given the constraint rankings established in Figure 6.5, we are left with the question of whether constraint demotion effectively moves learners from one stage to the next. Application of the Constraint Demotion Algorithm (Tesar and Smolensky 2000) would operate in the following manner:

Given the initial English constraint hierarchy, a native English speaker chooses candidate (b) of Tableau 6.5a as the optimal output candidate when the subject pronoun is a topic, and also when the subject is a non-topic (6.5b):

Tableau 6.5 English Ranking: PARSE » SUBJ » DROPT » AF-RT[5]

a. Subject is a topic

A. <*smiled* (x) , x=topic, x=*he*; T=pres perf>	PARSE	SUBJ	DROPT	AF-RT
a. [$_{IP}$ Ø *has* [Ø *smiled*]]	*!	*		
K b. [$_{IP}$ *he*$_i$ *has* [t$_i$ *smiled*]]			*	
c. [$_{IP}$ Ø *has* [[t$_i$ *smiled*] *he*$_i$]]		*!	*	

b. Subject is not a topic

B. <smiled (x) , x=he; T=pres perf>	PARSE	SUBJ	DROPT	AF-RT
a. [$_{IP}$ Ø *has* [Ø *smiled*]]	*!	*		
Kb. [$_{IP}$ *he*$_i$ *has* [t$_i$ *smiled*]]				
c. [$_{IP}$ Ø *has* [[t$_i$ *smiled*] *he*$_i$]]		*!		

When this speaker of English begins to learn Spanish, she quickly encounters sentences with null subjects, and her current English grammar makes the wrong choices with such sentences. Since the current grammar selects null subjects at a lower rate than the target grammar requires, the Constraint Demotion Algorithm (Tesar and Smolensky 2000) is activated, and the grammar begins to evaluate winner/loser pairs of candidates against the constraint hierarchy. Consider an input such as 6.2 where a topic subject is used in response to the question, 'Where did Juan go?'

(6.2.) ∅ *Fue* *a la playa.*
go-3sg-pst to the beach
'He went to the beach.'

As noted above, although both PARSE and SUBJECT must be demoted below DROPTOPIC, the developmental results help us establish that the first constraint demoted is PARSE. Tableau 6.6 shows the first loser/winner pair:

Tableau 6.6 Mark-data pair: Beginning grammar (null subjects)

loser/winner pairs	PARSE	DROPT
Loser: [$_{IP}$ *él*$_i$ [$_{VP}$ t$_i$ *fue a la playa*]]		*
Winner: [$_{IP}$ Ø [$_{VP}$ Ø *fue a la playa*]]	*!	

In Tableau 6.6, the target winner is not optimal according to the current (loser) grammar, requiring the operation of the Constraint Demotion Algorithm.

The CDA looks for the highest-ranked of loser violations. Given the logic of the learning algorithm, each constraint in the winner candidate is checked to see if it is dominated by the loser marks. In the above example, PARSE is not dominated by the loser mark DROPTOPIC. Therefore, the CDA requires PARSE be demoted to the stratum immediately below that of the loser mark, DROPTOPIC (Tableau 6.7):

Tableau 6.7 Demotion of PARSE

loser/winner pairs	PARSE	SUBJ	DROPT	AF-RT
Loser: [$_{IP}$ *él*$_i$ [$_{VP}$ t$_i$ *fue a la playa*]]			*	
Winner: [$_{IP}$ Ø [$_{VP}$ Ø *fue a la playa*]]	*!	*		

The resulting ranking still has the SUBJECT constraint in the winner candidate dominating the loser mark DROPTOPIC, so the CDA will eventually need to go into

operation once again. Before that additional movement is shown, we should first consider the status of the learner after the demotion that has yielded Tableau 6.8:

Tableau 6.8: Ranking after the demotion of PARSE

loser/winner pairs	SUBJ	DROPT	PARSE	AF-RT
Loser: [$_{IP}$ *él*$_i$ [$_{VP}$ t$_i$ *fue a la playa*]]		*		
Winner: [$_{IP}$ Ø [$_{VP}$ Ø *fue a la playa*]]	*!		*	

Tableau 6.8 shows that a restructuring of the grammar has taken place that moves the learner closer to the target language, but the resulting grammar at this stage is neither that of English nor of Spanish. The demotion of PARSE appears to be a radical step for English speakers and leaves them with uncertainty about what may be dropped in the target language and what may not. It is at this stage that learners take the unwarranted and unexpected step of dropping all subjects, not just those that are topic-connected. The grammar in Tableau 6.8 does not predict this result, if we assume that learners' outputs should be the result of their constraint rankings. It is clear that learners deviate from the learning their grammar has achieved, and this forces us beyond the formal account to recognize that interlanguage grammars are inherently unstable, both because interlanguage constraint hierarchies may fluctuate for a time and because learners may use general cognitive strategies to construct ad hoc hypotheses about the language they are learning.

LaFond, Hayes, and Bhatt (2001) attributed the simultaneous presence of target-like and non-target-like structures to a 'grammar in flux'. They argue that interlanguage stages may move from domination, to tendency, to optionality on their way to a reversal of dominance relations (Figure 6.5).

Figure 6.5 Grammar in flux (Adapted from LaFond, Hayes, and Bhatt 2001)

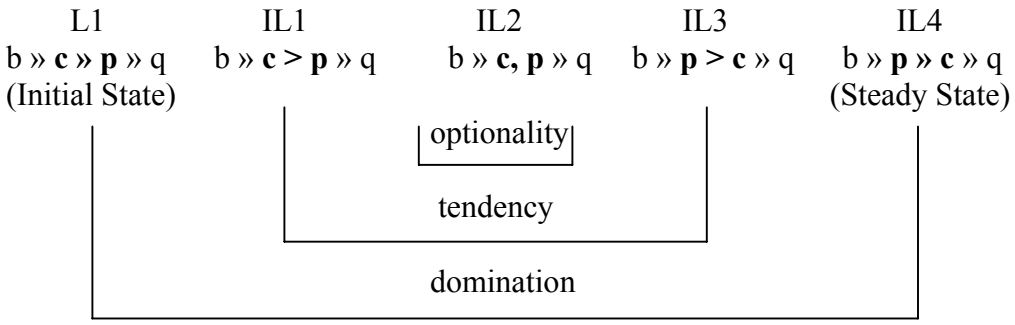

Figure 6.5 shows that the interaction of two constraints, c and p, in second language acquisition may involve more than a simple demotion of one constraint below the other. Dominance relationships may be weakened to tendencies (represented by the > symbol) or even optionality, and rankings displaying optionality or tendency may strengthen into a dominance relationship. 'Tendency' here refers to a preference for a particular constraint ranking (perhaps because that ranking is more familiar or easily learned). This tendency is one which may, perhaps uncomfortably, be violated under certain conditions. Several factors may impinge upon this preference, including the interplay of tied or non-ranked constraints in stratified hierarchies and general learning strategies that do not instantiate UG-based options in the grammar. The differences between domination, tendency and optionality can be illustrated even without reference to learner grammars. For example, one tendency mentioned earlier in this chapter related to the grammar's choice of *'I'll go' John said* vs. *'I'll go,' said John*. A grammar with a particular constraint ranking might 'tend' to choose the prior of those two sentences, since that sentence does not violate SUBJECT, but while the grammar may maintain a preference for this choice, it may also permit the latter option under certain conditions. If there is no clear preference between two choices, as is sometimes thought to be the case

in a pair of sentences such as *I said I'll go* vs. *I said that I'll go*, then we might understand the constraint rankings producing equally grammatical candidates as a case of true optionality.

If we consider learner grammars as works in progress, then the interplay of dominance, tendency, and optionality may be magnified. If Figure 6.5 (above) illustrates the functioning of a grammar within the unstable space of learner grammars, then we may better understand an environment characterized by hypothesis testing, backsliding, and failure as learner progressively move toward the target grammar. Further research into the possibility of grammars in flux may yield a better understanding of the relationship between UG-based hypotheses and general learning strategies, a concern that would help further explain the results obtained in this study.

The unstable character of learner grammars suggests one possible explanation of why learners may act in a manner not predicted by the state of their grammars. We may also note that the construct of 'subject' is far more salient than 'topic' in most language learning and instruction, and that learners are sometimes explicitly told that subjects are usually omitted in Spanish unless they are ambiguous or needed to indicate emphasis (Eric Holt, personal communication). Learners whose L1 make little use of topic status may need to learn what constitutes a topic (LaFond, Hayes, and Bhatt 2001), and it is understandable that the demotion of PARSE may leave learners uncertain as to which elements can be omitted and which can not. If the language instruction that learners have received has failed to distinguish between subject and topics, then we should not be surprised if learners resort to an ad hoc, non-UG-directed, rule in the face of a grammatical system that is in the process of restructuring but is not yet native-like.[6]

Returning to the learning algorithm, it is apparent that the ranking in Tableau 6.8 does not yet yield the target results (L2). Regardless of the reasons behind the overgeneralization of null subjects at the intermediate stage, learners eventually become sensitive to the fact that subjects in Spanish are dropped only when they are topics. If *Juan* in 6.3 (below) instantiates a non-topic, the target grammar requires the subject NP to be overt; if it instantiates a topic, that topic should be dropped.

(6.3.) *Juan*/∅ *fue* *a la playa.*
Juan go-3sg-pst to the beach
'Juan went to the beach.'

Since the interlanguage grammar of intermediates does not yet produce this result, further operation of the CDA is required. The grammar once again evaluates winner/loser pairs of candidates against the constraint hierarchy and now must demote the winner mark (SUBJECT) below the loser mark (DROPTOPIC), shown in Tableau 6.9:

Tableau 6.9 Demotion of SUBJECT

loser/winner pairs	SUBJ	DROPT	PARSE	AF-RT
Loser: [$_{IP}$ *él*$_i$ [$_{VP}$ t$_i$ *fue a la playa*]]		*		
Winner: [$_{IP}$ Ø [$_{VP}$ Ø *fue a la playa*]]	*!		*	

Following the demotion of SUBJECT, the grammar (Tableau 6.10a and 6.10b) now properly drops subjects only when they are topics. All other subjects are retained.

Tableau 6.10a Advanced grammar (subject is a topic)

	DROPT	PARSE	AF-RT	SUBJ
a. K [$_{IP}$ Ø [$_{VP}$ Ø *fue a la playa*]]		*		*
b. [$_{IP}$ *Juan* [$_{VP}$ t$_i$ *fue a la playa*]]	*!			

Tableau 6.10b Advanced grammar (subject is a non-topic)

loser/winner pairs	DROPT	PARSE	AF-RT	SUBJ
a. [$_{IP}$ Ø [$_{VP}$ Ø *fue a la playa*]]		*(!)		*
b. K [$_{IP}$ *Juan* [$_{VP}$ t_i *fue a la playa*]]				

Since this ranking correctly produces target outputs, the learning algorithm halts in regards to null subjects. Learners have converged on the target grammar in a two-step process, first by demoting PARSE in relation to DROPTOPIC, and then by demoting SUBJECT in relation to DROPTOPIC. Subjects are now dropped when topic-connected and retained when they do not instantiate a topic. Constraint demotion is thus able to yield the changes in the grammar related to null subjects that are suggested by the results of this study.

6.3 Inversion

The constraints shown thus far permit a description of the developmental path learners take in the acquisition of null subjects, but they do more than that; they also show why null subjects and inversion often pattern together — the second of the constraint demotions that takes place in the learning of null subjects is a demotion that results in the allowance of inversion.

To understand this result, it must be observed that the demotion that places SUBJECT on the tier below DROPTOPIC, places that constraint on the same tier as ALIGNFOCUS-RIGHT. Prior to this demotion, the requirement that the highest A-specifier in an extended projection be filled meant that the effects of ALIGNFOCUS-RIGHT would not surface, due to it always being dominated by SUBJECT. Following this demotion, the grammar has the option of filling either SUBJECT or ALIGNFOCUS-RIGHT, even though

satisfying one of the constraints will involve a violation of the other, if a focused element is in the input.

ALIGNFOCUS-RIGHT is a member of a general class of alignment constraints that permits consistency in the information ordering of the sentence. The definition of this constraint given by Grimshaw and Samek-Lodovici (1995) (cf. Figure 6.2 on p. 183) includes a directionality of the focusing, aligning the left edge of focus constituents with the right edge of a maximal projection.[7] This is also the definition that is used here. Just as English learners of Spanish need to demote certain syntactic constraints in their L1 grammar below the discoursal constraint of DROPTOPIC, so also must they recognize the need to maintain the level ranking of the discoursal constraint ALIGNFOCUS-RIGHT in regards to SUBJECT, despite the fact that in English ALIGNFOCUS-RIGHT is below SUBJECT. With respect to each other, SUBJECT and ALIGNFOCUS-RIGHT may be ranked in three different ways, and each of these ways results in a natural human language (Figure 6.6):

Figure 6.6 Ranking SUBJECT and ALIGNFOCUS-RIGHT

(a)	SUBJECT » ALIGNFOCUS-RIGHT	(English)
(b)	ALIGNFOCUS-RIGHT » SUBJECT	(Italian)
(c)	SUBJECT, ALIGNFOCUS-RIGHT	(Spanish)

Consider the different predictions these rankings make in Tableaux 6.11–6.13:

Tableau 6.11 SUBJECT » ALIGNFOCUS-RIGHT (English)

A. <wept (x) , x=focus, x=he; T=pres perf>	SUBJ	ALIGNF
a. [$_{IP}$ Ø *has* [Ø *wept*]]	*!	*
Kb. [$_{IP}$ *he*$_i$ *has* [t$_i$ *wept*]]		*
c. [$_{IP}$ Ø *has* [[t$_i$ *wept*] *he*$_i$]]	*!	

Tableau 6.12 ALIGNFOCUS-RIGHT » SUBJECT (Italian)

A. <wept (x) , x=focus, x=he; T=pres perf>	ALIGNF	SUBJ
a. [$_{IP}$ Ø *has* [Ø *wept*]]	*!	*
b. [$_{IP}$ *he*$_i$ *has* [t$_i$ *wept*]]	*!	
K c. [$_{IP}$ Ø *has* [[t$_i$ *wept*] *he*$_i$]]		*

Tableau 6.13 SUBJECT, ALIGNFOCUS-RIGHT (Spanish)

A. <wept (x) , x=focus, x=he; T=pres perf>	SUBJ	AF-RT
a. [$_{IP}$ Ø *has* [Ø *wept*]]	*	*(!)
K b. [$_{IP}$ *he*$_i$ *has* [t$_i$ *wept*]]		*
K c. [$_{IP}$ Ø *has* [[t$_i$ *wept*] *he*$_i$]]	*	

The tableau in 6.11, where SUBJECT dominates ALIGNFOCUS-RIGHT, will not permit inversion, while Tableau 6.12, where ALIGNFOCUS-RIGHT dominates SUBJECT, will require inversion of focus constituents. Tableau 6.13, in contrast to both of these, represents a grammar where the two constraints are unranked (or 'tied') with respect to each other.

To move from the ranking in 6.11 (English) to the ranking in 6.13 (Spanish), one might assume that learners must contrast SUBJECT directly with ALIGNFOCUS-RIGHT and realize that the dominance relationship must be undone, so that the constraints are now nonranked; however, CDA only demotes constraints to a stratum below a competing constraint. Given this operation of the algorithm, moving from a dominance relationship to a nonranked position must involve an interaction of two constraints at a higher stratum, not a direct interaction between the constraints of the higher stratum and the stratum to which that constraint is moving. Such a competition between two higher-ranking constraints does exist, namely the competition between SUBJECT and DROPTOPIC. Until learners demote SUBJECT below DROPTOPIC, SUBJECT is positioned in a dominance relationship to ALIGNFOCUS-RIGHT. It is only this demotion that positions SUBJECT and

ALIGNFOCUS-RIGHT in a tied-relationship and creates the optionality of inversion that Spanish exhibits.

The acceptance of inversion, therefore, is an epiphenomenon, a by-product of a grammar that either ranks SUBJECT above or below DROPTOPIC. To see this, consider again the predictions made by learners' intermediate and advanced grammars (Tableau 6.14 and 6.15):

Tableau 6.14 Intermediate grammar (inversion)

loser/winner pairs [+focus]	SUBJ	DROPT	PARSE	AF-RT
K a. [$_{IP}$ *Rosa*$_i$ [$_{VP}$ t$_i$ *va a estar allí*]]				*
b. [$_{IP}$ Ø [$_{VP}$ t$_i$ *va a estar allí*] *Rosa*]	*!			
c. [$_{IP}$ Ø [$_{VP}$ t$_i$ *va a estar allí*]]	*!		*	*

Tableau 6.15 Advanced grammar (inversion)

loser/winner pairs [+focus]	DROPT	PARSE	AF-RT	SUBJ
K a. [$_{IP}$ *Rosa*$_i$ [$_{VP}$ t$_i$ *va a estar allí*]]			*	
K b. [$_{IP}$ Ø [$_{VP}$ t$_i$ *va a estar allí*] *Rosa*]				*
c. [$_{IP}$ Ø [$_{VP}$ t$_i$ *va a estar allí*]]		*	*(!)	*

The L1 English grammar of learners (Tableau 6.14) does not accommodate inverted subject sentences or null subjects, therefore, (a) is the only grammatical choice. Once SUBJECT has been demoted below DROPTOPIC, however, the restructured grammar now accepts either inverted (b) or non-inverted (a) choices. Tableau 6.15c also makes a specific prediction not tested by this study, namely, that focused elements must be parsed; if left unparsed, the resulting candidate would fatally violate more than one constraint on the second tier.

The resulting grammar, therefore, is one in which either SUBJECT or ALIGNFOCUS-RIGHT can (indeed *must*) be violated, but neither of these violations is now

fatal to the grammar. This means that inverted orders may appear where alignment of focus is occurring, or a non-inverted order may be used (regardless of focus). Either choice is equally acceptable. Therefore, there are two 'winning' candidates. The result of this restructuring is a grammar that is 'relatively free' in regards to inversion. It is not fully free, because inversion would not be expected to surface in non-focused orders, since there is nothing to motivate the inversion; but, focused orders have the option of violating one constraint or the other, and neither option invokes a higher penalty. Again, the results in this study are consistent with this restructured grammar and with the CDA.

6.4 *That-trace*

Finally, we consider the observation that English displays an anti-*that-trace* effect, while Spanish regularly requires *that-trace* sequences. Some of the results of this study suggest that the grammatical property of *that-trace* is not salient for learners. Learners, even from the earliest stages, appear willing to accept at least some sentences with *que* plus a *trace*; but these learners do not realize the necessity of the use of the complementizer with certain matrix verbs.

Even though learners do not encounter *that-trace* in their L1, they frequently encounter subjects in subordinate clauses, and the complementizer variably precedes these subjects. The difference between this variability in their L1 and the non-variability of the L2 poses a learning challenge that is distinct but not separate from the acquisition of *that-trace*. These two distinct pieces of learning are illustrated by 6.4 and 6.5:

(6.4.) a. *¿Quién$_i$ piensas que t_i nos puede ayudar?* (Spanish)
b. **Who$_i$ do you think that t_i can help us?* (English)

(6.5.) a. *Yo creo que Ø vamos a encontrar a alguien.* (Spanish)
b. *I think (that) we are going to find someone.* (English)

In 6.4b, the inclusion of *that* in English makes the sentence ungrammatical. In contrast, the Spanish equivalent in 6.4a requires the complementizer, placing the Spanish grammar in direct conflict with English at this point. In 6.5, the inclusion of *that* in English is optional only in English; Spanish requires it. Furthermore, the null subject in 6.5 is not a trace, so we might predict that learners' grammars may adequately handle this type of item sooner than items such as 6.4 that instantiate *that-trace*.

Several different proposals have attempted to capture cross-linguistic differences in the realization of *that-trace* and complementizer optionality. In Section 2.6 of Chapter 2, two such proposals were discussed — that of Grimshaw (1997), in which the constraints regarding the government of traces (T-GOV and T-LEX-GOV) were employed to account for *that-trace* configurations, and that of Baković (1997),[8] in which complementizer optionality was derived from the interaction of faithfulness and markedness constraints upon differing inputs. Baković's FAITH[SUB] constraint was based on the idea that some functional features, such as a value of ± for subordination, are a part of the input.

One additional analysis of complementizers is found in Pesetsky (1997), in which cross-linguistic differences are understood, in part, to be the result of the an interaction of two constraints, TELEGRAPH and LEFTEDGE(CP). Pesetsky proposed TELEGRAPH as a syntactic constraint requiring that function words be left unpronounced. As such, it is a constraint that is sensitive to syntactic categories; for example, it is not failed by an overt NP, but it is failed by an overt complementizer. This is in keeping with prevailing

thought regarding economy conditions (Chomsky 1995) or economy of expression (Bresnan 1998), which holds that only elements that are 'meaningful' (i.e. contain semantic features) should be expressed.

A different type of economy consideration is at work with the LEFTEDGE(CP) constraint. LEFTEDGE(CP) is an alignment constraint that is discoursal in as much as it requires that information be packaged in a specific way. When a speaker desires to subordinate a thought to a higher matrix thought, arguably a discoursal concern, then a CP is projected to accomplish this information packaging requirement. CPs need not generally be projected for all clauses, as once thought, because the projection of an empty CP adds no additional information and thus violates general principles of economy (Chomsky 1995). When the projection of a CP does provide additional information (e.g. that the utterance following should carry the information-packaging feature of subordination) then a CP has reason to be projected. LEFTEDGE(CP) requires that in such a projection the leftmost overt word be the complementizer, a lexical head instantiating the category and aligning it in a manner similar to other alignment constraints. LEFTEDGE(CP), therefore, is violated when an embedded clause begins with anything other than the complementizer.

Of all the constraints proposed to account for complementizer effects, LEFTEDGE(CP) appears most susceptible to the critique of being ad hoc because it makes reference to a specific projection (CP) and a specific element within that projection (a complementizer). Despite this appearance, LEFTEDGE(CP) seems well motivated both because it effectively accounts for a broad range of data and because variant rankings of LEFTEDGE(CP) with respect to a constraint such as TELEGRAPH yield sets of actual

grammars. As with inversion, three possible rankings of these two constraints are possible, and these rankings each correspond to different human languages. Figure 6.7 shows the possibilities:

Figure 6.7 Ranking TELEGRAPH and LEFTEDGE(CP)

(a)	TELEGRAPH » LEFTEDGE(CP)	(Chinese)
(b)	LEFTEDGE(CP) » TELEGRAPH	(French)
(c)	TELEGRAPH, LEFTEDGE(CP)	(English)

The English grammatical ranking is that of Figure 6.7c, where optionality in the presence of *that* exists; both *I believe John won* and *I believe that John won* are grammatical. If TELEGRAPH outranks LEFTEDGE(CP) (Figure 6.7a), then complementizers are always dispreferred, which is the case with a language such as Chinese. Finally, if LEFTEDGE(CP) outranks TELEGRAPH (Figure 6.7b), then complementizers regularly appear, and the non-complementizer option is dispreferred, as in French.

Pesetsky (1997) also examined variation in the use of complementizers in French and English. He demonstrated that LEFTEDGE(CP) and TELEGRAPH also interact with a recoverability constraint (REC) that requires that the semantic content of unpronounced elements be recoverable from the local context. Pesetsky claimed that this interaction accounted for distribution of the complementizer not only in declarative clauses, but also in simple and complex relative clauses and in embedded questions.[9] For example, Pesetsky posited only a minimal difference between the ranking found in French (RECOVERABILITY » LEFTEDGE(CP) » TELEGRAPH) and the ranking found in English (RECOVERABILITY » LEFTEDGE(CP), TELEGRAPH), namely, that French ranks

LEFTEDGE(CP) over TELEGRAPH, while these two constraints are unranked with respect to each other in English.

This difference in ranking between the grammars of French and English yields a multitude of differences in grammaticality. For example the optionality of LEFTEDGE(CP) and TELEGRAPH in English (Tableau 6.22), but not in French (Tableau 6.23), results in variant outputs with respect to the declarative complementizer. (Examples taken from Pesetsky 1997:157-162; French and English examples are equivalent):

Tableau 6.16 Declarative complementizer (English)

	REC	LE(CP)	TEL
K *I believe* [$_{CP}$ *that Peter is hungry*].			*
K *I believe* [$_{CP}$ ~~*that*~~ *Peter is hungry*].		*	

Tableau 6.17 Declarative complementizer (French)

	REC	LE(CP)	TEL
K *Je crois* [$_{CP}$ *que Pierre a faim*].			*
Je crois [$_{CP}$ ~~*que*~~ *Pierre a faim*].		* !	

This variance in ranking also accounts for the difference between French and English in the outcome of simple relative clauses (Tableaux 6.18 and 6.19):

Tableau 6.18 Simple relative clauses (English)

	REC	LE(CP)	TEL
the man [$_{CP}$ *who that I know*]		*	*(!)
K *the man* [$_{CP}$ *who* ~~*that*~~ *I know*]		*	
K *the man* [$_{CP}$ ~~*who*~~ *that I know*]			*
K *the man* [$_{CP}$ ~~*who that*~~ *I know*]		*	

Tableau 6.19 Simple relative clauses (French)

	REC	LE(CP)	TEL
l'homme [$_{CP}$ *qui que je connais*]		*	*!
l'homme [$_{CP}$ *qui ~~que~~ je connais*]		*!	
K *l'homme* [$_{CP}$ ~~*qui*~~ *que je connais*]			*
l'homme [$_{CP}$ ~~*qui que*~~ *je connais*]		*!	

The interaction of constraints here also accounts for the similarity of English and French in the outcome of complex relative clauses (Tableaux 6.20 and 6.21) despite the difference in the constraint rankings of these languages:

Tableau 6.20 Complex relative clauses (English)

	REC	LE(CP)	TEL
the man [$_{CP}$ *with whom that I danced*]		*	*(!)
K *the man* [$_{CP}$ *with whom ~~that~~ I danced*]		*	
the man [$_{CP}$ ~~*with whom*~~ *that I danced*]	*!		*
the man [$_{CP}$ ~~*with whom that*~~ *I danced*]	*!	*	

Tableau 6.21 Complex relative clauses (French)

	REC	LE(CP)	TEL
l'homme [$_{CP}$ *avec qui que j'ai dansé*]		*	*(!)
K *l'homme* [$_{CP}$ *avec qui ~~que~~ j'ai dansé*]		*	
l'homme [$_{CP}$ ~~*avec qui*~~ *que j'ai dansé*]	*!		*
l'homme [$_{CP}$ ~~*avec qui que*~~ *j'ai dansé*]	*!	*	

The broad range of crosslinguistic data that are explained by positing a LEFTEDGE(CP) constraint lends credibility to Pesetsky's constraint and warrant its consideration for the acquisition of the complementizer properties of Spanish. If Pesetsky's analysis for French — which yields the result that complementizers regularly appear and the non-

complementizer option is dispreferred — may be extended to Spanish, then we may posit that LEFTEDGE(CP) is implicated in the necessity of the Spanish complementizer as well.

6.4.1 An initial analysis of *that-trace*

Pesetsky's proposal for complementizer optionality initially appears very promising. The main question for this developmental account, however, is whether the differences in the constraint rankings of English and Spanish related to LE(CP) and TELEGRAPH find a natural explanation under the proposed learning algorithm (CDA). The analysis here will eventually argue that Pesetsky's proposal fails in this regard, but the locus of the failure may be important for possible further refinements to the CDA or other learning algorithms, so this section makes an initial attempt at analyzing the acquisitional path related to complementizer optionality and *that-trace* using Pesetsky's constraints.

When learners hear questions such as 6.6, where the inclusion of *que* is necessary even if it violates *that-trace*, they begin to realize that a restructuring of their grammar is necessary to account for this new property.

(6.6.) *¿Quién*$_i$ *crees* *que* t_i *llamó?*
who think-2sg-pres that called-3sg-pret.
'Who do you think called?'

We might then assume that, as with the previous demotions, the grammar evaluates winner/loser pairs of candidates against the constraint hierarchy (Tableau 6.22).

Tableau 6.22 Mark-data pair: Advanced (*that-trace*)

loser/winner pairs	TEL	LE(CP)
Winner: *¿Quién$_i$ crees [$_{CP}$ que t$_i$ llamó]?*	*	
Winner: *¿Quién$_i$ crees [$_{CP}$ ∅ t$_i$ llamó]?*		*

The problem with applying the CDA now becomes immediately obvious. The learner grammar needs to demote TELEGRAPH below LE(CP) so that the requirement to omit function words gives way to the requirement for an overt complementizer. But how can CDA do this when both candidates in the initial hierarchy are winners? Without a loser to motivate the activation of demotion, there is no reason why either constraint should be demoted. Demoting TELEGRAPH below LE(CP) does indeed yield the correct results, but the current conception of CDA does not permit such a demotion here.

Nevertheless, if we suspend our judgment regarding the feasibility of such a analysis under CDA, several interesting observations may be made. If we assume that there is some mechanism by which demotion of TELEGRAPH below LE(CP) may take place, then we must note that the mark-data pair in 6.22 involves the operation of an interlanguage stage. For the L1 English to be compared with the Spanish, a fuller tableau undoing previous demotions related to null subjects would be needed. Without these intervening demotions, the nonranking of TELEGRAPH and LEFTEDGE(CP) would suggest that the complementizer is fully optional in English, even in cases where a *that-trace* sequence would be generated, and this is not the case. This means that Tableau 6.22 could only represent a stage subsequent to the early stages enabling null topic subjects. In cases where the subject is a non-topic, the Spanish would also have an overt pronoun in place of the *trace* in Tableau 6.22; this would make the correct prediction for English

— that either of the options in Tableau 6.22 is acceptable if there is an overt subject in the lower clause.

That dependency of Tableau 6.22 upon earlier reranking regarding null subjects yields one straightforward explanation of why *that-trace* surfaces later than null subjects in the learner grammars of the L1 English speakers in this study — *that-trace* sequences are disallowed in the early grammars because null subjects are disallowed. With the onset of null subjects, *that-trace* becomes acceptable, and the new learning task is simply to restrict the optionality involved in the realization of *que*. Tableau 6.23 shows the constraint demotion that would remove this optionality by moving TELEGRAPH below LEFTEDGE(CP):

Tableau 6.23 Demotion of TELEGRAPH

loser/winner pairs	TEL	LE(CP)
Winner: *¿Quién$_i$ crees [$_{CP}$ que t$_i$ llamó]?*	*	
Winner: *¿Quién$_i$ crees [$_{CP}$ ∅ t$_i$ llamó]?*		*

This demotion would results in the new ranking in Tableau 6.24:

Tableau 6.24 Ranking after the demotion of TELEGRAPH

		LE(CP)	TEL
K	*¿Quién$_i$ crees [$_{CP}$ que t$_i$ llamó]?*		*
	¿Quién$_i$ crees [$_{CP}$ ∅ t$_i$ llamó]?	*!	

The result of this demotion is that there are now clearly losing and clearly winning candidates. Violations of LEFTEDGE(CP) are now fatal to the grammar. The result of this restructuring is that choices between candidates should have a clear winner, where they previously did not. Such a result finds some support in this study. For example, in dialogue 9 of the grammaticality judgment task, only 43% of the beginners

choose to include *que*, but this percentage steadily increases, until near-native and native speakers include *que* 100% of the time with the verbs used in this study.[10]

As attractive as such an analysis might be, the problem remains that the demotion in Tableau 6.23 is not feasible under the CDA. The application of Pesetsky's analysis to the acquisition of Spanish in this study has additional limitations. Although his account addresses the issue of complementizer optionality, it does not address the issue of *that-trace*. As was seen above, *that-trace* effects may be derived with the use of Pesetsky's constraints, but only in concert with other constraints regarding null subjects. This is not a serious limitation, since the necessity of earlier constraint demotions would provide further confirmation of the main argument of this dissertation — that the grammatical properties subsumed under pro-drop are actually acquired at different times and in a certain developmental order — but the inability to use the CDA to account for this demotion means the Pesetsky's analysis must be discarded in this developmental account.

6.4.2 A revised analysis of *that-trace*

Since the account of Pesetsky (1997) encountered difficulties with the operation of the CDA, it may be asked whether the accounts of Grimshaw (1997) or Baković and Keer (2001) fare any better. Grimshaw's account introduces the constraint requiring that traces be lexically governed (T-LEX-GOV), and Baković and Keer employ this constraint in competition with a faithfulness constraint ensuring that the output for each candidate conforms to that candidates specification for subordination found in the input.

This section argues that Baković and Keer's analysis, applied to developmental data, operates within the parameters of the CDA. The favored analysis in this dissertation

interprets the developmental data of this study through a two-step learning process, the first step which involves an awareness of the CP status of all Spanish embedded clauses, and the second step which involves standard operation of the CDA.

We begin by assuming that the initial constraint ranking (English) is that found in Figure 6.8a, and the target constraint ranking (Spanish) is that of 6.8b.

Figure 6.8 Rankings yielding *that-trace*

a. English ranking: T-LEX-GOV » FAITH[SUB]
b. Spanish ranking: FAITH[SUB] » T-LEX-GOV

To move from the ranking in Figure 6.8a to the ranking in Figure 6.8b (Spanish), learners must demote T-LEX-GOV to the stratum below FAITH[SUB], but even prior to this demotion, learners begin to detect a subtle difference between their native English grammars and the grammar of Spanish. The results of this study showed that advanced learners accurately chose the overt complementizer in Spanish for those sentences whose English equivalent demonstrated apparent optionality, but did not accurately handle *that-trace* sentences until the near-native stage. Learners apparently first realize that sentences such as 6.7c and 6.7d, which appear to be optional in English, require the presence of the complementizer in Spanish (6.7a and 6.7b):

(6.7.) a. *Yo creo que vamos a encontrar a alguien.* (Spanish)
b. **Yo creo vamos a encontrar a alguien.*
c. *I think we are going to find someone.* (English)
d. *I think that we are going to find someone.*

The appearance of optionality in the English examples in 6.7, however, may be deceiving. The optionality of 6.7 vanishes if it is assumed that 6.7c and 6.7d are based on differing inputs, one with a [-subordination] feature and one with a [+subordination]

feature, making the structural distinction between 6.7c and 6.7d such that 6.7c is an IP and 6.7d a CP (Doherty 1993, Baković and Keer 2001).

The ranking of T-LEX-GOV » FAITH[SUB] in English yields an outcome that reflects the designation of the verbal extended projection in the input: if the verbal extended projection is an IP, no complementizer will appear in the output; if the verbal extended projection is a CP, the complementizer will appear. Since sentences such as those in 6.7 do not contain traces, T-LEX-GOV is vacuously satisfied regardless of the designation given in the input (Tableau 6.25a and 6.25b):

Tableau 6.25a Complementizer 'optionality' in English [+sub]

Input: [+sub]	T-LEX-GOV	FAITH[SUB]
a. *I think* [$_{IP}$ *we are going to find someone.*]		*!
K b. *I think* [$_{CP}$ *that we are going to find someone.*]		

Tableau 6.25b Complementizer 'optionality' in English [-sub]

Input: [-sub]	T-LEX-GOV	FAITH[SUB]
K a. *I think* [$_{IP}$ *we are going to find someone.*]		
b. *I think* [$_{CP}$ *that we are going to find someone.*]		*!

In Tableau 6.25a and 6.25b, whether the input calls for an overt complementizer (CP) or no complementizer (IP), the FAITH[SUB] constraint eradicates any lack of correspondence between the input and output of the subordinator feature.

Interestingly, transfer of this L1 constraint ranking will result in correct outputs for Spanish input in sentences such as 6.7a (above), but only once learners recognize that the Spanish input normally carries the [+sub] feature. Learners eventually make native-like choices with items such as these, but they first become fully aware of the persistent [+sub] feature at the advanced level. Tableau 6.26 (below) shows that in Spanish, as in

English, violation of FAITH[SUB] results in ungrammaticality. Once again, T-LEX-GOV is vacuously satisfied.

Tableau 6.26 Obligatory complementizer in Spanish [+sub]

[+ sub]	T-LEX-GOV	FAITH[SUB]
K *Yo creo*[$_{CP}$ *que vamos a encontrar a alguien.*]		
Yo creo[$_{IP}$ *vamos a encontrar a alguien.*]		*!

Therefore, the initial piece of learning that must take place is recognition that Spanish input displays a consistency not found in English – lower clauses in English may be IPs or CPs, while Spanish lower clauses are consistently CPs. Since this learning relates to an awareness of the input, no constraint reranking is necessary to yield appropriate outputs.[11]

Even after learners have become aware that Spanish input favors the [+sub] feature, the acquisition of *that-trace* is not yet complete. Since the L1 English grammar has not yet been required to restructure to handle Spanish inputs, the grammar is still one that does not permit violation of *that-trace*. Therefore, an English complement clause that has undergone subject extraction will not instantiate the complementizer, regardless of the subordination feature supplied by the input (Tableau 6.24a and 6.24b):

Tableau 6.27a Complementizer absence in English [+sub]

input: [+sub]	T-LEX-GOV	FAITH[SUB]
K Who$_i$ *do you think* [$_{CP}$ t$_i$ *called*]?		*
Who$_i$ *do you think* [$_{CP}$ *that* t$_i$ *called*]?	*!	

Tableau 6.27b Complementizer absence in English [-sub]

input: [-sub]	T-LEX-GOV	FAITH[SUB]
K Who$_i$ *do you think* [$_{CP}$ t$_i$ *called*]?		
Who$_i$ *do you think* [$_{CP}$ *that* t$_i$ *called*]?	*!	*

Since this result is at variance with the target (Spanish) grammar, Constraint Demotion is triggered but, unlike the problem posed by Pesetsky's initial non-ranking of LE(CP) and TELEGRAPH, here the CDA functions properly because a winner/loser pair may be identified (Tableau 6.28):

Tableau 6.28 Mark-data pair: Advanced (*that-trace*)

loser/winner pairs [+sub]	T-LEX-GOV	FAITH[SUB]
Loser: *¿Quién*$_i$ *crees* [$_{CP}$ t$_i$ *llamó*]?		*
Winner: *¿Quién*$_i$ *crees* [$_{CP}$ *que* t$_i$ *llamó*]?	*!	

In Tableau 6.28, the winner mark, T-LEX-GOV, must become dominated by the loser mark, FAITH[SUB]. Therefore, the CDA requires that T-LEX-GOV be demoted to the stratum immediately below that of the loser mark, FAITH[SUB] (Tableau 6.29).

Tableau 6.29 Demotion of T-LEX-GOV

loser/winner pairs [+sub]	T-LEX-GOV	FAITH[SUB]
Loser: *¿Quién*$_i$ *crees* [$_{CP}$ t$_i$ *llamó*]?		*
Winner: *¿Quién*$_i$ *crees* [$_{CP}$ *que* t$_i$ *llamó*]?	*!	

The resulting ranking is shown in Tableau 6.30:

Tableau 6.30 Ranking after the demotion of T-LEX-GOV

[+sub]	FAITH[SUB]	T-LEX-GOV
¿Quién$_i$ *crees* [$_{CP}$ t$_i$ *llamó*]?	*!	
K*¿Quién*$_i$ *crees* [$_{CP}$ *que* t$_i$ *llamó*]?		*

As with the first analysis using TELEGRAPH and LE(CP), this demotion now yields losing and winning candidates in keeping with Spanish grammar. Since this ranking converges on the target grammar, no further demotions are needed. This reranking takes learners to the near-native stage. The final grammar is one in which the complementizer

que will be present whenever it is present in the input, even if this results in a violation of T-LEX-GOV. Since lower clauses in Spanish normally include the [+sub] feature, *que* will regularly appear in all subordinate clauses, as the data from this study also confirms.

6.6 Summary of the analysis

To summarize the findings regarding how the developmental path of learners involves recursive stages of constraint demotion, each stage of the grammar is now presented with a total ranking of all six constraints. This shows that each stage, from beginners through near-native speakers involves new demotions, some of which could not take place until they were preceded by others. The fact, for example, that the demotion resulting in inversion could not precede the demotions resulting in null subjects, has no clear account in a GB-theoretic analysis, but it actually is accounted for under the CDA analysis presented here. Consider the following total rankings and each movement that takes learners to the next stage (Figures 6.9)

Figure 6.9 Constraint demotion and the total ranking

Beginners (English): PARSE » SUBJ » DROPT» {AF-RT, T-LEX-GOV} » FAITH[SUB]

Demote PARSE below DROPTOPIC

Intermediates: SUBJ » DROPT » {PARSE, AF-RT, T-LEX-GOV} » FAITH[SUB]

Demote SUBJECT below DROPTOPIC

Advanced: DROPT » {SUBJ, PARSE, AF-RT, T-LEX-GOV} » FAITH[SUB]

Demote T-LEX-GOV below FAITH[SUB]

Near-native (Spanish): DROPT » {SUBJ, PARSE, AF-RT }» FAITH[SUB] » T-LEX-GOV

Each stage in Figure 6.9 is represented by one demotion, and each demotion yields a new grammar that is used by learners to progressively move towards the target language. The need to demote PARSE below DROPTOPIC initially confuses beginning learners, and this is reflected in the overgeneralization of subject dropping. Intermediate learners eventually become cognizant of the discourse condition involved with null subjects, and when they demote SUBJECT below DROPTOPIC, the result is not only a refined grammar in regards to null subjects, but also the emergence of grammar that permits inversion of focused constituents. At the advanced levels, learners become aware that Spanish lower clause inputs regularly carry the [+sub] feature. This realization results in the obligatory instantiation of *que* in sentences where English displays apparent optionality. The final demotion of T-LEX-GOV below FAITH[SUB] permits learners to overcome the grammaticality constraint in their L1 that would normally prohibit *that-trace* sequences. Each of the demotions in Figure 6.9 is consistent with the CDA, lending support for its application to issues of second language development.

6.7 General conclusions and implications for future research

This dissertation has proposed a new account of the developmental path second language learners take in regards to the grammatical properties traditionally associated with pro-drop. This proposal has been supported by empirical tests of the L2 acquisition of Spanish by native speakers of English. These tests demonstrated that the various elements encapsulated in the term 'pro-drop' are acquired by second language learners in a particular developmental order that is predictable from the relative rankings of grammatical constraints in the native and second languages. These results challenge

traditional parameter setting accounts of pro-drop by arguing that the grammatical properties associated with pro-drop are epiphenomena resulting from particular constraint rankings within a grammar, not the switching of a single parameter to a particular, inviolable setting.

The first hypotheses of this dissertation (H1 in Section 4.1 of Chapter 4) held both that the implicational hierarchy of Liceras (1989) would be validated by the results here and also that this hierarchy would be insufficient to distinguish between the initial acceptability of null subjects, inversion and *that-trace*, and accurate judgments regarding these properties. The implicational hierarchy of Liceras (1989) did not find strong support because *that-trace* choices surfaced earlier and at a greater rate than expected. Nevertheless, the findings of this study are not inconsistent with Liceras' hierarchy, and in Section 5.4 of Chapter 5, some reasons were forwarded for maintaining the hierarchy despite its lack of positive evidence here.

The second hypothesis (H2 in Section 4.1 of Chapter 4), that initial acceptability would be distinct from accurate judgments, found strong confirmation. Null subjects surfaced early, but it was not until the late stages of acquisition that these subjects were selected with a native-like frequency and distribution. Inversion presented a bit more complicated case. Learners did not often select inversion; however, choices for inversion occurred more frequently when constituents were focused, and the difference between these conditions is likely due to the demotion of certain syntactic constraints in English that compete with discoursal constraints in Spanish. *That-trace* choices may have surfaced early, but these choices were not accurately acquired until much later, some time between the advanced and near-native stages.

A third hypothesis (H3 in Section 4.1 of Chapter 4) held that some L2 learners would eventually (in the later stages of acquisition) converge on native-like usage of null subjects, inversion and *that-trace*, and that this convergence would come as a result of a sensitivity to the discoursal constraints of the language. This hypothesis dealing with ultimate attainment was largely confirmed (although the evidence for convergence in regards to inversion is less clear). As the analysis in this chapter demonstrated, final convergence in two cases was the result of sensitivity to discoursal constraints: for null subjects, convergence came through an awareness of the proper ranking of DROPTOPIC with respect to syntactic constraints and for inversion, convergence came as a by-product of the reranking of SUBJECT of DROPTOPIC that created a new non-ranked relationship between SUBJECT and ALIGNFOCUS-RIGHT. Each case involved demotion of syntactic constraints in relation to discoursal constraints in the target language.

The results here argue against accounts in which autonomous applications of syntax fail to admit interactions between syntax and discourse. The developmental path taken by L2 learners is best characterized in terms of the interaction between these two components of grammar, and the precise path that learners take confirms the final hypothesis — that these results have a natural interpretation under the operation of the Constraint Demotion Algorithm of Tesar and Smolensky (2000). There is strong evidence that the interaction between syntax and discourse for L2 learners is not parameterized — lower-ranked constraints remain operative within the language and higher-ranked constraints are sometimes violated. Both of these circumstances challenge those formulations of pro-drop that are built on inviolable principles.

One contribution to linguistic theory that this study makes is a clearer statement of the facts related to the path L2 learners take as they acquire the features of a 'pro-drop' language. Perhaps this contribution may advance linguistic theory not only by specifically providing empirical support for the Constraint Demotion Algorithm (CDA) proposed by Tesar and Smolensky (2000), but also by reinforcing the soundness of an Optimality Theoretic approach to issues in language learning more generally.

The application of OT to second language learning represents a new and potentially productive line of inquiry. The results here provide support for viewing the variant outputs of interlanguage grammars as differences in the rankings of syntactic and discoursal constraints. The results also leave many questions unanswered, however, and suggest a future research program devoted to exploring how constraint interactions between various levels of grammatical knowledge are used by learners in the acquisition of a second language. There is a clear need for future research in this area, perhaps beginning with further improvements on the research design used here, but also extending to the study of other language groups and other grammatical properties. My hope is that this project has provided some new insights into interfaces between syntax and discourse in the acquisition of Spanish learner grammars, and that these insights will lead to further investigations that will advance our understanding of second language acquisition.

Notes

[1] Some researchers (e.g. Broekhuis and Dekkers 2000) prefer the 'tied' or equal ranking option, accepting A»B and B»A, but the option of nonranking with respect to each other is used by Tesar and Smolensky (2000) and is followed here. One difficulty with accepting both rankings, aside from the challenge it would seem to pose to OT conceptually, is that such the learner would continue to receive evidence contrary to each of the rankings, creating an instability in which the grammar demotes one constraint (A) below the other (B) and then demotes that constraint (B) back below (A) in an endless loop. While this is theoretically possible, the failure for the CDA to converge in such instances would be a less-than-welcome result.

[2] The possibility of constraints with equal ranking is not without certain theoretical difficulties. For example, some of the formal results demonstrating constraint demotion are based upon totally ranked hierarchies, and likewise, most conceptions of OT regard target grammars to be totally ranked hierarchies. Tesar and Smolensky (2000:48) concede that stratified hierarchies present the possibility that constraint demotion will fail to converge, rearranging constraints with each piece of conflicting data; nevertheless, it is possible to distinguish, as Tesar and Smolensky do, between the presence of stratified hierarchies in learner grammars and their presence in target grammars. The learning algorithm may operate in the larger space (i.e. that of stratified hierarchies) while target grammars may be totally ranked hierarchies, or on the verge of achieving this total ranking. One way of arriving at this result is to make the endpoint of learning one in which hierarchies are not fully ranked, because the learning algorithm is left without sufficient evidence to further refine the grammar into a fully ranked hierarchy (Tesar and Smolensky 2000:49). Another way constraint demotion may learn stratified hierarchies is to assume 'multiple optimal outputs' (Tesar and Smolensky 2000:50) that do not involve an identical set of marks. Nevertheless, as Tesar and Smolensky (2000:50) state, 'achieving ties for optimality between forms that incur different marks is always a delicate matter'. Therefore, although the analysis used in this chapter assumes that stratified hierarchies exist in the native, learner, and target grammars, it would be useful to pursue further research either into constraint interactions that might derive the same results without the use of nonranked or tied constraints, or into further refinements of the learning algorithm that would more efficiently handle stratified hierarchies.

[3] Since PARSE does not dominate SUBJECT in Spanish, violations of PARSE may appear in a broader range of contexts then English. The most common example is that PARSE no longer prohibits null topic-connected subjects, because it is dominated by DROPTOPIC. Unlike English, in Spanish, PARSE, SUBJECT, or both constraints may sometimes be violated without incurring a fatal violation. In Ecuadorian Spanish, for example, topic-connected objects may drop (cf. Suñer and Yépez 1988), violating PARSE, but not SUBJECT:

A:	¿Comió Juan el pan?	A':	Did John eat the bread?
B:	Sí, Juan comió Ø.	B':	*Yes, John ate Ø.

[4] The analysis that follows is not strictly dependent upon the validity of the assumption that PARSE and SUBJECT are unranked in Spanish. If PARSE does dominate SUBJECT also for Spanish, then the only required modification to the current analysis would be to first demote PARSE to a stratum below DROPTOPIC, but above ALIGNFOCUS-RIGHT, and then demote SUBJECT below PARSE to the stratum of ALIGNFOCUS-RIGHT. This possibility does yields the same results as the current analysis.

[5] The inclusion of ALIGNFOCUS-RIGHT in this tableau is to show the stratum below DROPTOPIC which may become the landing site for demotions of constraints initially dominating DROPTOPIC.

[6] It would be useful to investigate how naturalistic language acquisition compares to instructed learning in this regard. The possibility that learners are simply reflecting some instructional effect would find greater support if learners in an uninstructed, naturalistic acquisition environment do not overgeneralize null subjects in the same manner as the learners in this study did.

[7] Alignment constraints could result in leftward, as well as rightward, movement of constituents. The constraint discussed here is specified as ALIGNFOCUS-RIGHT. Movement to this position is not the only possible mechanism for focusing elements. For example, focus in both English and Spanish may occur in situ by placing prominent intonational stress on the focused constituent. Also, fronting constituents to indicate contrastive focus, as in *Carrots, I like* provides another focusing strategy. These processes are related to the focus discussed in this chapter, in as much as they likely involve an interaction between differing levels of grammar (phonology, discourse, or syntax), but they are distinct from the focus strategy discussed here, and the constraints that account for these variant strategies are a topic for further research.

[8] More recently incorporated into Baković and Keer (2001).

[9] Pesetsky (1997:159) also shows that interactions between LEFTEDGE(CP) and TELEGRAPH account for the absence of pronounced complementizers in verb-second orders in German.

[10] There are verbs in Spanish that do not require the use of *que* for subordination, but their number is very limited. The account provided here does not explain why these verbs have special status, but it would explain how verbs that provide the [-sub] feature to the input would be realized in the output without a complementizer. The FAITH[SUB] constraint must require the output to conform to the lexical features of the verb (subordination being one of these features). This places the locus of variation in the requirement for the complementizer in the lexicon. The grammar interacts with the input supplied by the lexicon by either attempting to maintain the input (via faithfulness constraints) or by attempting to make the input conform to some syntactic principle (via markedness constraints)

[11] It should be noted that some researchers have reservations about OT analyses that derive systematic differences between languages through the use of differing inputs. The analysis here, as with the analysis of Baković and Keer (2001), may be perceived to be at variance with the standard OT principle of the 'Richness of the base' (Prince and Smolensky 1993, section 9.3). This principle states that 'the set of possible inputs to the grammars of all languages is the same'. Tesar and Smolensky (2001:30) assert that 'all systematic properties of the lexicon arise indirectly from the grammar, that delimits the inventory from which the lexicon is drawn'. However, even if we maintain that crosslinguistic variation is primarily a result of the operation of a grammar, the nature of the input a grammar uses in its operation is still a matter of lively debate, particularly in OT syntax. While most agree that predicate/argument structure is a part of the input, whether or not functional features may be included has not yet been resolved. The analysis here, following Baković and Keer (2001), assumes that these functional features are indeed available to the syntactic learner and used in the operation of the grammar.