

Word Order and Scope: Transparent Interfaces and the $\frac{3}{4}$ Signature

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A recurring pattern of partial correlations between word order variation and scope possibilities (the $\frac{3}{4}$ *signature*) supports a particular view of economy constraints in syntax, with these properties: (1) There are economy conditions (soft constraints) that value a particular type of correspondence between LF and PF representations. (2) These constraints are unidirectional: LF (broadly construed) is calculated first and determines PF (surface word order). (3) Scope rigidity is a property not of languages but of specific configurations, and the distribution of rigidity effects is (largely) predictable from independent variation in the syntactic resources of various languages.

We focus here on the interaction of these three assumptions and on the role of (2) in predicting the $\frac{3}{4}$ signature effect. We contrast our proposal with Reinhart's (2005) Interface Economy model, in which economy conditions regulate a mapping that takes overt structure as its input and yields permissible interpretations.

Keywords: economy, scope, information structure, scrambling, reconstruction, LF-PF interface, constraint interaction

1 Overview

Our primary concern in this article is the relationship between word order and (certain aspects of) interpretation. It is a commonplace observation that there appears to be an inverse correlation between rigid word order and scope rigidity: languages with free word order are often said to “wear their LF [scope] on their sleeves” (Szabolcsi 1997:111), while languages with restricted possibilities for word order permutation, like English, have a high tolerance for scope ambiguity. Our focus here is not on this (inverse) correlation per se, but on the particular ways in which

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deviations from an inverse correlation are and are not licensed across languages. Specifically, we argue that a quite general pattern exists, in which, for a given combination of LF and PF properties, the acceptable correlations are neither fully rigid nor fully free. For example, given a binary choice at LF (A takes scope over B, or B takes scope over A) and a corresponding binary choice at PF (A precedes B, or B precedes A), rigidity would predict only two of the four combinations to be acceptable; but often, instead, three of the four logical pairings are acceptable and only one is unacceptable. We call this the $\frac{3}{4}$ effect, and we argue that it arises as the characteristic signature of the interaction of soft constraints. In addition, we argue that careful attention to which three pairings are allowed, and which one is excluded, implicates the view that the input to the relevant constraints is a representation of meaning (LF, broadly construed) and that the constraints in question determine the “best” PF for a previously given LF. These facts thus support a model in which (in Government-Binding (GB)/Minimalist Program terms) LF (or something like it) is the input to Spell-Out (cf., e.g., Bobaljik 1995, 2002, Brody 1995, Erteschik-Shir 1997), a view that is also held in various Optimality Theory approaches to syntax (see especially Grimshaw 1997, Legendre, Smolensky, and Wilson 1998, Pesetsky 1998, Broekhuis 2008). This point is more subtle than it may appear, as the evidence in the literature, when taken at face value, appears to be contradictory on this score. In the course of the article, we will address one apparent counterexample to the view we advocate here (from reconstruction effects), and we will engage in some detail a prominent and directly opposing theoretical view—that of Reinhart (2005), whose Interface Economy model explicitly holds that word order is determined first, and that economy conditions regulate the interpretations available for a given word order.

The article is organized as follows. We begin (section 2) by making explicit a perspective on rigidity that is widely, if informally, held. We then set out the basic proposal, and we examine some cases that illustrate the workings of the machinery, reanalyzing a variety of data from the literature from the perspective presented here (section 3). The availability of scope reconstruction, even in languages often characterized as “scope-rigid,” presents a *prima facie* problem, which we address in section 4. In section 5, we contrast our proposal with a related framework (Reinhart’s (2005) Interface Economy) that explicitly rejects one of our crucial assumptions. We show that the view presented here provides a more parsimonious account of the same range of data, using a proper subset of the assumptions needed in the alternative. Finally, we look forward at work that remains to be done to get this research program off the ground.

2 Scope Transparency

2.1 Rigidity and Economy

Many authors have suggested a universal, but violable, constraint that favors a correspondence between word order and scope interpretation. In languages in which left-to-right order typically reflects c-command (among major constituents), this generally amounts to a condition that relates precedence to scope: if A takes scope over B (at LF), then A should precede B (at PF), all else being equal. Explicit proposals for an economy condition along these lines include Bobaljik’s

(1995, 2002) Minimize (PF:LF) Mismatch and Diesing's (1997) Scope Principle.¹ Analogous proposals in frameworks that are more heavily or exclusively constraint-oriented include Müller's (2000, 2002) Shape Conservation and proposals made by Williams (2003), Reinhart (2005), and Broekhuis (2008). We give one version of such a condition here:

(1) *Scope Transparency (ScoT)*

If the order of two elements at LF is A»B, the order at PF is A»B.

We use the symbol » to represent the canonical manifestation of hierarchical order at the relevant level: roughly, scope at LF (we will expand this below to encompass information-structural notions) and linear precedence at PF.² As a soft constraint, ScoT is not expected to be universally surface-true; rather, it should be respected to the extent that a language's resources allow for it, and violated only as a last resort. Thus, a constraint like ScoT provides a means for making explicit the common assumption that the freedom of word order provided by scrambling concomitantly restricts the possibilities for nonsurface scope readings.³ Note that this view assumes no rigidity/Quantifier Raising (QR) parameter, and that languages do not "lack QR" as such. Rather, scope options will be (at least in part) a factor of available word-order-changing operations in a given context, within a given language. As we will build on these ideas in our study of deviations from rigidity, we take a moment to dwell on this point here.

A paradigm example of the crosslinguistic contrast in scope flexibility/rigidity is given in (2): inverse scope among the quantified DPs is possible in English, but not in Japanese (or analogously, German). One way of thinking about this contrast is to relate it to the independent difference that Japanese "freely" allows scrambling, which reverses the order of the DPs on the surface—and the scrambled sentence allows the object to take scope over the subject (2c).⁴ In other words, inverse scope in (2b) is blocked by the availability of (2c), which is a more transparent reflection of the scope. QR is possible in this context in English, precisely because English lacks scrambling.

¹ Pesetsky's (1989) Earliness Principle, one of the earliest proposals within the Economy framework, would have something like Diesing's Scope Principle as a consequence under some assumptions.

² For all of the examples we will consider, it will suffice to consider » at PF to indicate linear precedence, though we assume that the relationship mapping syntactic c-command to linear order is more complex.

³ For explicit claims to this effect regarding German, see for example Lenerz 1977, Uszkoreit 1987, and Beck 1996; and for more nuanced but related suggestions, see Diesing 1992.

⁴ We do not discuss "long" (i.e., interclausal) scrambling here. Long scrambling in Japanese has different properties than short (clause-internal) scrambling. Long scrambling is often described as semantically vacuous—for example, unable to reverse the order among quantifiers in different clauses (this is sometimes referred to as radical reconstruction). This is known to be an oversimplification; the more accurate generalization appears to be that a long-scrambled DP cannot be interpreted in the highest clause, but it may reconstruct only partway down, being interpreted in any of the intermediate positions it moves through. See, for example, Saito 2003 and Otaki 2007 and references therein.

- (2) a. Some toddler read every book. E»A; A»E
 b. Dareka-ga subete-no hon-o yonda.
 someone-NOM all-GEN book-ACC read
 ‘Someone read all the books.’ E»A; *A»E
 (Kuroda 1970)
 c. Subete-no hon-o dareka-ga yonda.
 all-GEN book-ACC someone-NOM read
 ‘Someone read all the books.’ A»E possible

The view that relates the difference in scope possibilities to the (un)availability of scrambling stands in contrast to the prevailing view (at least in some circles) that scope is projected from surface structure (i.e., without QR) in languages such as German and Japanese (see, e.g., Huang 1982, Hoji 1985, Frey 1989, 1993, Aoun and Li 1993, Lechner 1996, 1998a,b, Krifka 1998). To the extent that English permits QR, such a view at least implicitly posits a parametric difference in the availability of the movement operation QR, rather than deriving scope differences from a prior syntactic difference.⁵ We provide further evidence below that QR and (overt) scrambling are indeed (negatively) correlated, even within a single language, and thus against the idea of a QR or rigidity parameter.

The tables below show explicitly how the scope contrasts can be related to scrambling. We will discuss these in some detail to provide a feel for the logic that will run throughout the rest of the article, and also to illustrate notational conventions we will use in more complex examples below.⁶ Table (3) represents the basic rigidity contexts in German or Japanese, while table (4) represents the corresponding contexts in English, a language with no scrambling, but with QR. The core point of tables (3)–(4) is simply this: ScoT is respected when the LF and PF ‘match’ and violated otherwise; however, the violation is tolerated (as in English) when it is not otherwise possible for word order to faithfully reflect a particular scope relation. Throughout the tables, we use the convention that A and B indicate the base (e.g., prescrambling) order of the items in question. Thus, with respect to (2), A is the subject and B is the object.

⁵ Alternatively, to avoid this kind of QR parameter, it has been proposed that scope is always determined at surface structure, even in languages like English, and that scope ambiguity in subject-object contexts arises from the presence of a subject trace below the object (see, e.g., Hornstein 1995, Kitahara 1996). However, this approach, while avoiding a QR parameter, is still faced with the basic question of how German-type languages differ from English-type languages; that is, one would need to find motivation for the claim that German lacks traces in places where English has them (see also May and Bale 2006 for criticisms).

⁶ Although we use tables as a convenient means of representing constraint interactions, we do not intend to imply a commitment to Optimality Theory (OT). We aim here to remain agnostic among the many frameworks that have in common the use of soft constraints, including OT and the Economy framework, as well as hybrid models such as those of Pesetsky (1998) and Broekhuis (2008). In what follows, we make no crucial use of the mechanisms that differentiate OT from the Economy framework, such as constraint ranking and reranking as a theory of variation, or the absence of universally inviolable constraints.

(3) *German, Japanese scrambling*

	LF	PF	ScoT
a. ✓	B»A»t _B	B»A»t _B	✓
* (QR)	B»A»t _B	A»B	*
b. ✓	A»B	A»B	✓
* (Reconstruction)	A»B	B»A»t _B	*

(4) *English*

	LF	PF	ScoT
a. * Scrambling	B»A»t _B	*B»A»t _B	✓
✓ (QR)	B»A»t _B	A»B	*
b. ✓	A»B	A»B	✓
* Scrambling	A»B	*B»A»t _B	*

Consider first (3a). This is a situation in German or Japanese in which the object takes scope over the subject (thus, LF = B»A). Since these are scrambling languages, there are two candidate PFs to consider: the “moved” order (PF = B»A) and the unmoved order (PF = A»B). Of these, only the moved order faithfully reflects the scope order, satisfying ScoT. The combination of unmoved surface order with inverse scope is thus excluded. The German/Japanese situation should be contrasted with English. For the corresponding LF (scope of object over subject), the ScoT-respecting PF is unavailable, as English lacks scrambling (we have shaded the corresponding lines in (4)). In this case, then, there is only one candidate PF to consider, namely, PF = A»B. Even though this pairing of LF and PF violates ScoT, there is no better pairing (in English), and hence it is permitted. The effect, then, is that inverse scope is permitted in English, but not in German or Japanese, in this context.

Consider now the (b) portions of (3) and (4). These represent cases in which the scope corresponds to the base order, with the subject taking scope over the object. In both tables, the basic (unscrambled) PF order matches the scope order and thus satisfies ScoT. In English, there is nothing more to say, but for German/Japanese, we must consider the alternative candidate, involving scrambling. The expectation is that scrambling should be disallowed when the scope is A»B, since this would constitute an unforced ScoT violation. In fact, however, this seems to be at odds with well-known observations. In Japanese and German, short scrambling does appear to reconstruct for scope purposes, and hence the apparent pairing of an overtly moved order with A»B scope is permitted, and normally described as scope reconstruction. In section 4, we will argue that true syntactic (LF) reconstruction is in fact excluded even in Japanese and German, and that the effect of scope reconstruction in these contexts is achieved by different (semantic)

means. Anticipating that discussion, we will thus treat (3) as an accurate characterization of (the syntax of) scope rigidity in languages like Japanese and German.

Before going further, we pause to introduce one further general consideration. The tables above have been presented as if the competing candidates in, say, (3a) involve distinct derivations, one in which the syntactic operation of scrambling has applied and one in which it has not. Viewed from this perspective, ScoT would be a transderivational constraint, comparing competing derivations globally. This is an artifact of the presentation. The interpretation of the constraints that we favor is that the syntactic operation of scrambling happens in all (relevant) cases, but the competing word orders (PFs) represent a choice between pronouncing the moved element in the higher position and pronouncing it in the lower position (between the higher and lower copy, to use a common metaphor). Covert movement is thus technically recast as regular syntactic movement, but with the lower copy being pronounced (see Bobaljik 1995, 2002, Brody 1995, and many others). The (a) lines of tables (3) and (4) should hence be seen as shorthand for the derivations in (5) (German/Japanese) and (6) (English).⁷

- | | | | |
|--------|-------------|---|-----------------|
| (5) a. | Syntax: | [<i>someone</i>]-NOM [<i>every book</i>]-ACC read | |
| | “Overt” QR: | [<i>every book</i>] [<i>someone</i>] [<i>every book</i>] read | |
| b. | LF output: | [<i>every book</i>] [<i>someone</i>] [<i>every book</i>] read | |
| c. | PF1: | [<i>every book</i>] [<i>someone</i>] [<i>every book</i>] read | √ScoT (2c) |
| | *PF2: | [<i>every book</i>] [<i>someone</i>] [<i>every book</i>] read | *ScoT (2b) |
| | | | |
| (6) a. | Syntax: | <i>Some toddler read every book</i> | |
| | “Overt” QR: | [<i>every book</i>] [<i>some toddler</i>] read [<i>every book</i>] | |
| b. | LF: | [<i>every book</i>] [<i>some toddler</i>] read [<i>every book</i>] | |
| c. | *PF1: | [<i>every book</i>] [<i>some toddler</i>] read [<i>every book</i>] | *Scrambling |
| | PF2: | [<i>every book</i>] [<i>some toddler</i>] read [<i>every book</i>] | *ScoT tolerated |

Notice that in the above discussion, it is crucial that the input to evaluation by ScoT consists of various PFs competing to represent a given LF. If competition evaluated all LF-PF pairings together, or if economy conditions took a PF string as the input and computed more and less economical LFs (as in Reinhart’s (2005) model, discussed below), the wrong results would be obtained for English. In either case, the winning QR candidate in (4a) would have to compete with the first candidate in (4b), and it would lose. QR would thus be incorrectly excluded in English. (We return in section 5 to a discussion of how Reinhart’s model proposes to avoid this.)

⁷ In this article, we follow a single-output model as proposed in Bobaljik 1995, 2002 and Brody 1995. However, the analysis could easily be implemented in a cyclic spell-out model. In the derivations in (5) and (6), for instance, the first cycle (phase) is the vP, and QR of the object targets a vP-adjoined position. When the vP phase is complete, the structure is transferred, and copy choice, which is restricted by ScoT, is determined as part of transfer (see Wurmbrand 2011 for a specific phase-based model for QR in English, which, similarly to the model in Cecchetto 2004, derives the locality conditions on QR as an effect of cyclic spell-out).

To avoid clutter, all further tables will be written as in (3)–(4), but are to be understood in terms of movement plus (non)pronunciation of copies. As in (3)–(4), not all silent copies will be explicitly indicated in the PF representations. For languages like German and Japanese, this makes little substantive difference. For English, it means that we are effectively assuming (e.g., with Johnson and Tomioka 1998, Johnson 2000) that QR is (syntactically) equivalent to scrambling, and that to say that English “lacks scrambling” is to say that the movement in question is not pronounced in the higher position (for evidence of “overt but unpronounced” QR in English, see Fox and Nissenbaum 1999).

2.2 *The Scope of ScoT*

At this point, we should address three frequently asked questions. We will make a few brief qualifying remarks, but we postpone extended discussion until sections 3, 4, and 5.

First, we have already noted that ScoT (like a hypothetical rigidity parameter) does not distinguish between QR and reconstruction. Specifically, where word order is free, scope should be rigid, and both QR and reconstruction should be disallowed (see (3)). As noted, this is at odds with the observations reported in the literature, whereby languages like German and Japanese are held to lack QR but to admit reconstruction. Here, following in particular Lechner (1996, 1998a,b), we take the position that the reconstruction involved is so-called semantic reconstruction—interpretation of the trace as a higher-order type—rather than syntactic reconstruction. The key evidence is that semantic reconstruction is not expected to obey what Lebeaux (1995, 2009) terms LF coherence, and in the cases at hand, it does not. The discussion is relatively complex, and we thus postpone the arguments to section 4, but take the results as shown for the remainder of the article.

Second, ScoT is not intended to replace the various other conditions restricting QR (and other scope-shifting operations). We assume that QR is still subject to a variety of syntactic (hard) constraints (island constraints, clause/phase-boundedness, additional constraints on specific quantifiers, etc.). For example, just because overt movement of some element B across some other element A is impossible does not (under our reasoning) entail that inverse scope will be possible. In (7a), inverse scope is impossible among the quantified DPs, even though the lower QP cannot undergo overt movement. The impossibility of inverse scope is unrelated to ScoT in this case; instead, it is due to the fact that the universal quantifier is embedded in an island out of which QR is impossible (cf. (7b)). QR (and covert movement generally) is treated here as syntactic movement, with the lower copy pronounced. Where the underlying movement (whether covert or overt) is syntactically ruled out, ScoT does not come into play.

- (7) a. A doctor will examine the suggestion that we sedate every new patient. * $\forall \gg \exists$
 b. *Which patients will a doctor examine the suggestion that we sedate t_{wh} ?

Put differently, ScoT is an economy condition regulating choices among convergent derivations. ScoT rules out QR in certain constructions (i.e., when there is a more economical alternative)

but does not “rule in” otherwise illicit derivations (such as those violating locality restrictions on QR). Relatedly, ScoT determines whether in a particular configuration, a certain scope relation is possible *in principle*. ScoT does not regulate aspects of quantifier scope, such as language-specific restrictions on whether a particular (type of) quantifier can undergo QR or reconstruction (see, e.g., Lechner 1998b and Pafel 2005 for additional restrictions in German, and Szabolcsi 2010 for a more general survey).

Third, we call the reader’s attention to the importance of various qualifications about alternative word orders’ being “freely” available. Our paradigm rigidity contrast was derived from the impossibility of scrambling in English, but of course, there are other means by which the (underlying, thematic) object may come to precede the (thematic) subject—for example, by topicalization (8b) or passive (8c).

- | | |
|--|--|
| (8) a. Every detective interviewed exactly two suspects. | $\exists \gg \forall; \forall \gg \exists$ |
| b. Exactly two suspects, every detective interviewed. | PF: $B \gg A$ |
| c. Exactly two suspects were interviewed by every detective. | PF: $B \gg A$ |

Our account of the availability of QR in English in examples like (8a) relies crucially on the lack of a PF order that is faithful to the inverted LF $B \gg A$. For this to work, there must be some principled reason whereby (8b–c) do not qualify as competing alternatives in the way that scrambling does (in German and Japanese). At this point, we do not have a definitive answer, but we believe that, in particular for passive, what is relevant is the role of a numeration (or something similar) in restricting the appropriate reference/comparison set. In line with much work in the Economy approach, we assume that economy conditions only evaluate competing derivations from the same numeration (input), and thus that corresponding active and passive sentences will simply not compete with one another. For passive, this is fairly straightforward as the morphology relatively clearly supports the idea that the two derivations start from different numerations. For topicalization in English, we will need the assumption (which we make use of throughout the article) that information structure (topic, focus) is part of LF in the relevant sense and thus that topicalization structures have a different LF than counterparts without topicalization. This will ensure that (8a) and (8b) do not compete. For now, we beg the reader’s indulgence in granting that scrambling is “free” in a way that topicalization is not (this intuitive difference is routinely asserted in the relevant literature); we will return briefly to the question of how topic and focus structure interacts with scope in section 3.4.

2.3 Against a “Rigidity” Parameter

The way we have set up the system, ScoT regulates the choice among distinct PFs competing to express a given LF. In particular, the more flexibility there is in word order, relative to a given LF, the more transparent the PF should be. Rigidity is thus not formally a characteristic of languages (i.e., not a parameter); rather, it should characterize particular syntactic configurations. We provide two pieces of evidence for configuration-dependent variation in rigidity here: the scope of nominative objects in Japanese and inverse linking in German.

A well-known property of Japanese potential constructions involving a nominative object is that the object can take scope over the potential verb (see (9a)).⁸ Following earlier work (see Wurmbrand 2001, Bobaljik and Wurmbrand 2005, 2007), we assume that nominative objects are base-generated in a VP complement of the potential verb and move to a position above the potential verb. However, despite being able to take matrix scope, nominative objects still cannot take scope over matrix subjects (see (9b); and see, e.g., Yatsushiro 1999, Takahashi 2010).

- (9) a. John-ga migi-me-dake-ga tumu-re-ru.
 John-NOM right-eye-only-NOM close-can-PRES
 ‘John can only close his right eye.’
 ‘It is only his right eye that John can close.’ *only » can*
 (Tada 1992:94)
- b. Dono-gakusei-mo koyubi-dake-ga mage-rare-ru.
 which-student-every pinkie-only-NOM crook-can-PRES
 ‘Every student can crook only his pinkie.’ **only » every; ^{OK}only » can*
 *‘It is only his pinkie that every student can crook.’
 ‘For every student, it is only his pinkie that he can crook.’
 ‘Every student can crook his pinkie and no other fingers.’
 (Takahashi 2010:345)

Following Wurmbrand (2008), Takahashi (2010) proposes that this limitation follows from ScoT. Japanese is a strictly head-final language; hence, the order of ‘only’ and the potential verb is fixed at PF—ordering the potential verb before ‘only’ is not an option. Hence, ScoT can be violated with respect to the ordering of the object and the matrix verb (as in PF2 in (10c)), and the object can take scope over the potential verb (see the full derivation in (10), where English words are used for convenience).

- (10) a. Syntax: John-NOM [[right-eye-only-NOM close] can]
 QR: John-NOM [right-eye-only-NOM] [[right-eye-only-NOM close] can]
 b. LF: John-NOM [right-eye-only-NOM] [[~~right-eye-only-NOM~~ close] can]
 c. *PF1: *John-NOM can [right-eye-only-NOM] [~~right-eye-only-NOM~~ close]
 PF2: John-NOM [right-eye-only-NOM] [[~~right-eye-only-NOM~~ close] can]

On the other hand, the overt ordering of the nominative object and the matrix subject in (9b) is flexible, as shown in (11a). The derivation in (11b–d) (we ignore the lowest copy of the object in the lower VP in this structure) shows that if the wide scope interpretation of the object over the subject is intended, only the scrambled order (i.e., PF1 in (11a)) is licensed by ScoT—the nonscrambled order in (9b) (= PF2) violates ScoT, hence is excluded.

⁸ We set aside here the still-debated question of whether the nominative object must take scope over the potential verb or can also take low scope (see, e.g., Sano 1985, Tada 1992, Koizumi 1995, Matsumoto 1996, Saito and Hoshi 1998, Saito 2000, Wurmbrand 2001, Nomura 2003, 2005, Takano 2003, Bobaljik and Wurmbrand 2005, 2007, Takahashi 2010).

- (11) a. Koyubi-dake-ga dono-gakusei-mo mage-rare-ru.
pinkie-only-NOM which-student-every crook-can-PRES
‘Every student can crook only his pinkie.’ ^{OK}only » every; ^{OK}only » can
(Takahashi 2010:346)
- b. Syntax: *every student*-NOM [*pinkie-only*-NOM] [*crook can*]
QR: [*pinkie-only*-NOM] *every student*-NOM [*pinkie-only*-NOM] [*crook can*]
- c. LF: [*pinkie-only*-NOM] *every student*-NOM [~~*pinkie-only*~~-NOM] [*crook can*]
- d. PF1: [*pinkie-only*-NOM] *every student*-NOM [~~*pinkie-only*~~-NOM] [*crook can*]
√ScoT
- *PF2: [~~*pinkie-only*~~-NOM] *every student*-NOM [*pinkie-only*-NOM] [*crook can*]
*ScoT

Thus, Japanese is not a scope-rigid language. Wide scope achieved via ‘covert’ movement is available in this language, as long as that scope relation cannot be achieved by overt movement.⁹

A similar case for configuration-dependent variation in rigidity can also be made with regard to German. Responding to claims that German lacks QR, Sauerland (2001) and Sauerland and Bott (2002) examine a variety of contexts other than the interaction between clausal coarguments such as subject and object DPs. Specifically, these authors examine coordinate constructions and inverse linking contexts, and demonstrate that QR is available in (some of) these contexts in German. We illustrate the argument for QR using inverse linking constructions—that is, constructions in which a quantifier takes scope over a quantified noun phrase it is contained in.¹⁰ As

⁹ Goro (2007:85–87) briefly considers a view like ours that ties the availability of inverse scope to the blocking effects of a competing derivation (Goro suggests a pragmatic version). Goro rejects the approach for two reasons. The first is the apparent availability of scope reconstruction in putatively scope-rigid languages. For German and Japanese, this objection is addressed, and mooted, in Wurmbbrand 2008, 2010 (see also section 4). The second reason is that inverse scope (QR) is apparently available in Japanese, even in some contexts where scrambling is also available. Crucially, in our view, Goro does not consider anything beyond (the equivalent of) ScoT. Most of the current article is devoted to showing how this constraint interacts with other considerations to yield more subtle predictions. In particular, we consider examples in which scrambling is *prima facie* available, but covert scope shifting is also available, due to some additional factor (such as topic-focus order) favoring an unmoved order (see (36b) for a case in point from German, and additional discussion in Wurmbbrand 2008, 2010). Note that all examples that Goro provides showing inverse scope between two quantifiers in Japanese also involve a verb that is (arguably) scope-bearing and whose contribution to the derivation is not taken into account.

At this point, more work is needed to determine whether Goro’s specific examples constitute a problem for our approach or whether they can be accounted for along the lines of (9a). What is clear from Goro’s work, and consistent with the main thrust of our argument here, is that scope in Japanese, like German, is indeed not rigid, and that a variety of factors come into play in determining whether and when inverse scope is available.

Another interesting range of Japanese data we have not explored involves interactions between the universal *zen-in* ‘all’ and negation, as discussed by Miyagawa (2010). Miyagawa shows that scope possibilities do vary as a function of word order, but the word order variation does not concern the relative linear order of the quantifier and negation (the latter is always final). Miyagawa also argues that *-mo*-marked (focus) phrases obligatorily take scope over a clausemate negation; he takes this as evidence for movement to a dedicated focus position in Japanese and invokes [$\pm$ focus] as syntactic features involved in probe-goal relations. Adequately engaging Miyagawa’s proposals and arguments, and asking how his framework would fare with regard to the data presented here, is a project we must leave to future work.

¹⁰ See May and Bale 2006 for a review of the literature on inverse linking and the problems it poses in particular for syntactic proposals that claim to dispense with QR.

shown in (12a), German allows inverse linking in certain contexts. Sentence (12a) allows (and with the given context favors) an interpretation whereby the universal quantifier ('every musician') takes scope over the existential 'a/one record' (as there is no single record made by all the musicians). This interpretation is easily available in German and, most importantly, does not require the special intonation necessary in other inverse scope constructions in the language (this claim is substantiated by the results of the elicited production experiments conducted by Sauerland and Bott (2002)).¹¹

- (12) *Context*: Two friends are talking about last night, when one of them visited Peter, who's crazy about jazz. On that occasion, Peter played a record by Miles Davis, a record by John Coltrane, and a record by Fred Frith.

- a. Peter hat eine Platte jedes Musikers aufgelegt.
 Peter has a/one record (A) every.GEN musician (B) played
 'Peter played a record by every musician.' $\exists \gg \forall; \forall \gg \exists$
- b. *Peter hat jedes Musikers eine Platte aufgelegt.
 Peter has every.GEN musician (B) a/one record (A) played

Given the assumptions we have made, we expect that since QR is possible in this configuration, it must be the case that (overt) scrambling of the genitive phrase is prohibited. This is indeed correct, as (12b) shows. Crucially, the availability of inverse linking shows that movement of genitives is possible in principle, as long as this movement is covert (see below for the scope properties of cases that are clearly excluded by locality constraints). The difference between (12a) and (12b) is thus essentially a PF difference: given the unavailability of the matching PF in (12b), (12a) is allowed despite the ScoT violation arising in this case.

More striking evidence that the (un)availability of QR is indeed a question of the word order possibilities for a given numeration comes from the pair in (13a) (i.e., a construction where the complement of the noun is realized as a prepositional phrase). As Sauerland and Bott (2002) note, (13a) differs from the genitive construction in (12a) in that inverse scope is possible only when special intonational marking is used. This difference, although rather unexpected in traditional QR accounts, follows straightforwardly from the system developed here, once we take into account the overt movement potential of these constructions. The prepositional construction differs sharply from the genitive construction in whether the nominal complement can undergo overt movement: while overt movement of a genitive complement is excluded (see (12b)), overt movement of a PP complement is perfectly acceptable (see (13b)).

- (13) a. Peter hat eine Platte von jedem Musiker aufgelegt.
 Peter has a/one record (A) of every musician (B) played
 'Peter played a record by every musician.' $*\forall \gg \exists$ (without special intonation)

¹¹ The interaction of intonation and scope in German with respect to the current framework is addressed in section 4, and in more detail in Wurmbrand 2008.

- b. Peter hat von jedem Musiker eine Platte aufgelegt.
Peter has of every musician (B) a/one record (A) played
'Peter played a record by every musician.'

Tables (14) and (15) represent the structures we propose for NP-internal PP and genitive arguments. The availability of overt scrambling of the PP in (14) (= (13)) forces rigidity, whereas the inflexibility of the word order with the genitive argument allows a ScoT violation in (15) (= (12)). Thus, the ScoT model correctly predicts the scope difference attested between (12b) and (13b) in Sauerland and Bott's (2002) experiments.

(14) *PP*

	LF	PF	ScoT
✓	B»A	B»A»t _B	✓
* (QR)	B»A	A»B	*

(15) *Gen*

	LF	PF	ScoT
N/A	B»A	B»A»t _B	✓
✓	B»A	A»B	*

Before we accept this conclusion, however, a few comments about the structures we propose are necessary. The first issue to address is whether German *von*-PPs are indeed moved from within the noun phrase (as suggested above) or are base-generated in the VP (see, e.g., Cinque 1990 for the latter view). We follow Fortmann (1996) in assuming that *von*-PPs undergo movement from a DP-internal position. Fortmann provides two major arguments for movement instead of base generation (or reanalysis). First, dislocation of a *von*-PP is only possible when the noun phrase does not include a genitive specifier ((16) is from Fortmann 1996:28, (87); our translations).

- (16) a. Von welchem Motor hat die Reparatur t viel Zeit gekostet?
of which motor has the repair t much time cost
'Which motor's repair took a long time?'
b. Müllers Reparatur von diesem Motor hat viel Zeit gekostet.
Müller's repair of this motor has much time cost
'Müller's repair of this motor took a long time.'
c. *Von welchem Motor hat Müllers Reparatur t viel Zeit gekostet?
of which motor has Müller's repair t much time cost

The same holds for examples such as (13b): movement across a specifier is impossible (see (17a)), and the nonscrambled version in (17b) has only the interpretation according to which Maria has a record made by all musicians. The blocking effect of a DP-internal specifier follows straightforwardly if *von*-PPs that are in a thematic relationship with a noun are base-generated within the noun phrase and undergo movement. Assuming, for instance, that DPs are phases, Spec,DP needs

to be available for a PP to move out of the DP phase to escape spell-out. If *von*-PPs were base-generated as arguments or adjuncts in the VP, it would be hard to explain why the presence versus absence of a specifier of the object has an effect on the (im)possibility of the *von*-PP.

- (17) a. *Peter hat von jedem Musiker Marias Platte aufgelegt.
 Peter has by every musician Maria's record played
 b. Peter hat Marias Platte von jedem Musiker aufgelegt.
 Peter has Maria's record by every musician played
 'Peter played Maria's record by every musician.'

Fortmann's second argument is that a *von*-PP is possible even when it cannot be interpreted as an argument or adjunct of the verb. Regarding examples such as (13b), the choice of matrix verb does not matter. However, DP-internal differences do matter: the *von*-PPs are impossible when the noun phrase is changed to a pronoun (as pronouns cannot be modified by PPs).

- (18) a. Peter hat von jedem Rocker die erste Platte zerstört/gesehen/zerkratzt.
 Peter has by every rocker the first record destroyed/seen/scratched
 'Peter destroyed/saw/scratched the first record by every rocker.'
 b. *Maria hat {sie} von jedem Punker {sie} zerstört/gesehen/zerkratzt.
 Maria has {it} by every punker {it} destroyed/seen/scratched
 'Lit. Maria destroyed/saw/scratched it by every punker.'

Finally, Fortmann (1996:107ff.) argues (see also Bošković 2010) that in contrast to *von*-PPs, which function as arguments, true adnominal adjuncts cannot be extracted from a noun phrase.

- (19) a. der Bruder von Max aus Köln
 the brother of Max from Cologne
 'Max's brother from Cologne'
 b. Von wem hat [der Bruder t_{PP} aus Köln] angerufen?
 by who has [the brother t_{PP} from Cologne] called
 'Whose brother from Cologne called?'
 c. *Aus welcher Stadt hat [der Bruder t] angerufen?
 from which city has [the brother t] called
 *'The brother from which city called?' (OK as 'Which city did the brother call from?')

We follow Fortmann (1996) and Bošković (2010) in assuming that movement of adjuncts out of a noun phrase is prohibited by syntactic locality conditions (the specific formulation of the locality conditions does not matter for our purpose; see Bošković 2010 for a recent phase-based account). Interestingly, as pointed out by an anonymous reviewer, examples such as the one in (20) do not allow inverse scope (unlike (12a) and (13a), these constructions have not been tested experimentally, but the second author agrees with the reviewer here). Under the assumption that movement of adjuncts is impossible (whether overt or covert), we correctly predict that inverse scope is also impossible (note again that ScoT does not overrule syntactic locality violations).

- (20) a. Peter hat eine Platte mit jedem Remix aufgelegt.
 Peter has a record with every remix played
 ‘Peter played a record with every remix.’ $*\forall\gg\exists$ (any intonation)
- b. *Peter hat mit jedem Remix eine Platte aufgelegt.
 Peter has with every remix a record played

The above discussion has shown that there is a three-way contrast regarding scope options in nominal constructions: inverse scope is impossible under any intonation in (20a), inverse scope is only possible under special intonation in (13a), and inverse scope is possible under any intonation in (12a). The ScoT model correctly predicts this distribution, in conjunction with the proposed structure of noun phrases and the assumption that locality prohibits movement of adjuncts (Fortmann 1996, Bošković 2010) but allows movement of genitive arguments in principle (but with a restriction to lower-copy pronunciation).¹² Whenever syntactic locality blocks movement, inverse scope is impossible. Where syntactic movement is possible, wide scope for the NP that originates in the lower position is possible in principle, but is subject to ScoT, which regulates inverse scope on the basis of the (PF) copy choices available. Thus, inverse scope (relative to PF order) is possible only when syntactic movement is not blocked by locality, and in addition, only where the overt pronunciation in the higher position is blocked.

3 ScoT at Work: The $\frac{3}{4}$ Signature

With the understanding of ScoT (and qualifications) discussed above, we are now in a position to look at the interaction of our proposed economy condition with other economy conditions, and to present one of the major reasons for thinking that something like our proposal may indeed be on the right track. In this section, we will present three data paradigms which share the property that, given two LF choices and two PF choices, three of the four logical combinations are judged acceptable—a phenomenon we call the $\frac{3}{4}$ signature. We argue that this is precisely what is expected if ScoT is a soft constraint and interacts with other economy conditions. Specifically, given a particular LF representation and two competing PF representations, if ScoT and another condition align, respecting both is more economical than violating both, and a pairwise grammaticality contrast will result. On the other hand, if ScoT and another condition impose conflicting requirements such that no single PF can simultaneously satisfy both conditions, we expect (all else being equal) a tie: both PFs will be possible expressions of the LF in question. Note that the examples considered will provide key support for the claim that the LF-PF isomorphism condition (ScoT) is asymmetric and gives LF a privileged status. PF representations compete to find the

¹² We do not have an explanation for the fact that genitives must be pronounced within the noun phrase. (The same holds for *wh*-genitives, which cannot move independently but require pied-piping of the noun phrase; crucially, even genitives that appear at the edge of the noun phrase—a position from which extraction is generally allowed—cannot be extracted overtly.) However, the fact that inverse scope is possible indicates that a rigid syntactic ban on movement of genitives is incorrect.

best expression of a given LF, not the other way around (contrast, e.g., Bobaljik 1995, Reinhart 2005). As before, we start schematically and then proceed to increasingly more complex examples.

3.1 Evidence for ScoT: $\frac{3}{4}$ Signature Effects

Table (21) illustrates schematically an example of the $\frac{3}{4}$ signature effect. As above, the first column represents the actual (reported) judgments, and A and B stand for two relevant elements, where the base order is A»B. There are two ways of looking at such a paradigm. If we take the PFs first, we can describe this paradigm by saying that one PF (A»B) is ambiguous ((a), (d)) while the other (B»A) is unambiguous ((b) vs. (c)). This is the manner in which such paradigms are standardly described (see below). What we wish to emphasize here is an alternative perspective: looking at two possible LFs first. Within the relevant paradigm, one LF (B»A) can be expressed by either of two PFs, but the other LF (A»B) can find phonological expression in only one way. Note, of course, that either way of looking at things provides a *prima facie* challenge to ScoT: if the syntax allows for overt movement (of the relevant kind) of B across A, then ScoT appears to predict that only two LF-PF pairings are possible—those that are faithful to one another. So why is one mismatched representation allowed, but not the other?

(21) *The $\frac{3}{4}$ signature*

		LF	PF	ScoT
a.	✓	A»B	A»B	✓
b.	*	A»B	B»A	*
c.	✓	B»A	B»A	✓
d.	✓	B»A	A»B	*

Our answer is that in such cases ScoT interacts with some other economy constraint (we will specify what this is in each case below). In the schematic example here, we could consider the effects of an additional constraint that privileges the A»B order at PF, independently of scope considerations. As a temporary stand-in for constraints to be introduced below, we label this for now simply C1. The constraint interaction is schematized in (22) and (23). Recall that we crucially do not adopt any ranking among these economy conditions.¹³

¹³ Our approach here is thus similar to the mechanisms of tied rankings or constraint conjunction in OT, on which there is a large literature. One pertinent question that emerges from the general discussion of tied constraints is whether such situations can actually arise in a full-blown analysis, when any other constraints/conditions that may be active in the language (or universal) are also taken into consideration. For the case in table (23), we must ask whether there might be some other constraint that favors one candidate or another, and whether that would nullify the ‘‘tie’’ effect we crucially depend on. Various technical means exist for sidestepping this problem. For concreteness, at least as a working hypothesis, we adopt the interpretation of *free ranking* from Kager 1999 (cf. also Anttila 2007). In brief, if two constraints C_1 , C_2 are freely ranked with respect to one another, then the grammar generates (admits as grammatical) the winner in a competition calculated with the ranking $C_1 \gg C_2$ and the winner of $C_2 \gg C_1$. On this interpretation of ‘‘tied’’ constraints, lower-ranked constraints will play no role as tiebreakers and may be ignored. We thank an anonymous reviewer for pushing for explicitness on this point.

(22) *LF: A»B*

		LF	PF	ScoT	C1
a.	✓	A»B	A»B	✓	✓
b.	*	A»B	B»A	*	*

(23) *LF: B»A*

		LF	PF	ScoT	C1
a.	✓	B»A	A»B	*	✓
b.	✓	B»A	B»A	✓	*

It is essential to this account that there are two independent, pairwise competitions, anchored to a given LF representation. That is, each LF representation constitutes the input, and the “best” PF representation is chosen to realize it (cf. Pesetsky 1998, Broekhuis 2008).¹⁴ In the competition to express the scope relation A»B, two PF representations are considered in (22): A»B and B»A. In this case, ScoT and C1 both favor the same representation, and there is a clear winner and a clear loser. However, in the competition to express the scope B»A, schematized in (23), neither PF simultaneously satisfies both conditions. ScoT can be satisfied at the expense of C1, or a C1 violation can be avoided at the expense of requiring QR. As we will show in the remainder of section 3, in exactly such configurations, both LF-PF pairings are acceptable.

The logic we have developed here thus predicts that in situations of (potential) constraint conflict, if ScoT privileges LF over PF, we will find paradigms in which exactly three of the logical possibilities are in fact grammatical, while one is excluded. And that is indeed what we find.¹⁵ Note that the effect emerges only if, as we have suggested, ScoT regulates the choice of PF to express a previously given LF. If the competition were to take the PF as given and assign an appropriate LF (as in Reinhart’s (2005) Interface Economy model, which we discuss further below), then only two of the four combinations would be predicted to be acceptable, not three (the reader can verify this by pairwise comparison of the (a) lines of the two tables ((22a) would win) and of the (b) lines ((23b) would win). Similarly, if ScoT simply valued matching and the reference set for the competition included all four pairings, then the expectation would be that only (22a) would be acceptable, as it is the only pairing that simultaneously satisfies both constraints.

At this point, we turn to examples of the ¾ signature effect.

¹⁴ Our approach is therefore most compatible with theories in which PF spells out the LF representation (Bobaljik 1995, 2002, Brody 1995), as opposed to more traditional “Y” models in which PF and LF are each derived from a common, but more abstract, level of S-Structure.

¹⁵ Our reasoning here is in some ways parallel to the OT logic that “bans only the worst of the worst” (BOWOW; see Prince and Smolensky 2004, Smolensky and Legendre 2006). Detailed comparison with that approach would take us too far afield at this point.

3.2 *There-Insertion*

Our first example is taken from the discussion of *there*-insertion in English in Bobaljik 2002, a precursor to the line of analysis we are generalizing in this article.¹⁶ As is well-known, an existentially quantified DP in a raising construction may take scope above a raising predicate such as *likely* (itself a scope-bearing element), or it may reconstruct beneath it.¹⁷ The PF in (24a) is ambiguous. On the other hand, if raising fails to apply and expletive *there* occupies the matrix subject position (as in (24b)), the scope relations are unambiguous, and the existential quantifier can only be interpreted beneath the raising predicate (see Den Dikken 1995). This is particularly surprising in light of the facts that English normally allows QR and that if anything, existentials tend to be somewhat freer in having wide scope than other quantifiers. Why is wide scope disallowed in (24b)?

- (24) a. (Exactly) one student is likely to be absent. $\exists \gg \text{likely}; \text{likely} \gg \exists$
 b. There's likely to be (exactly) one student absent. $*\exists \gg \text{likely}; \text{OK} \text{likely} \gg \exists$
 c. *Is likely to be (exactly) one student absent.

The account suggested in Bobaljik 2002 is predicated on the further observation that English respects the “classic” Extended Projection Principle (EPP). That is, it is a language-particular property of English that the finite subject position must be overtly filled.¹⁸ As the constraint refers to phonological overtiness, this must be a condition on PF representation and not the “narrow” syntax. As (24c) demonstrates, the EPP is a hard constraint in English; violation leads to ungrammaticality. Now, English offers two possibilities for “repairing” or avoiding an EPP violation: one is overt movement, and the other is insertion of a dummy element, the expletive *there*. Crucially, we assume that *there* is not part of the (syntactic) numeration, but is inserted at PF, to satisfy the EPP (compare CP expletives in languages like German and Icelandic, which are inserted to satisfy another PF condition, the verb-second requirement). We make the familiar

¹⁶ Bobaljik (1995, 2002) also discusses object shift in the Germanic languages in essentially these terms, drawing on ideas in Diesing 1997 (the latter reinterpreted from an OT perspective in Engels and Vikner 2006). These authors focus on the puzzle that in Icelandic, a postverbal (i.e., unshifted) object may only have a nonspecific or new-information reading when shift is otherwise possible. However, an object in the same position is not restricted in its semantic import when shift is independently excluded (e.g., by Holmberg's Generalization effects). Bobaljik (1995) and Diesing (1997) argue that this state of affairs implicates a soft constraint that values a correlation between word order and interpretation, but only to the extent that this is independently possible in a given context. We focus instead on the *there*-insertion context in this section, since, unlike the object shift cases, examples such as (24) involve the relative order of two scope-bearing elements.

¹⁷ It is important to our account that reconstruction in this example is syntactic, not semantic (see section 4). That this is indeed the case is confirmed by the interdependence of scope and binding in such examples, in English, in contrast to the examples treated as cases of semantic reconstruction in section 4 (see, e.g., Fox 1999).

¹⁸ See Wurmbrand 2006 for renewed arguments that this is indeed a point of crosslinguistic variation, even within Germanic, and that the EPP is not universal.

assumption that insertion of an expletive is “costly,” a matter of “last resort,” and we express this by means of the economy condition in (25).

- (25) *DEP*
Don’t insert expletive pronoun.

With DEP now in our arsenal, we have two economy conditions to consider: DEP and ScoT. Table (26) schematizes their interaction. Again, as in tables (22)–(23), following our hypothesis that competition regulates the choice among PFs for a specified LF, there are two pairwise comparisons to make. Note of course that failure to insert *there* in (b) and (c) will cause a fatal EPP violation, and PFs with an empty subject position are thus not considered (recall that economy conditions only evaluate convergent derivations).

(26) *English raising*

		LF	PF	ScoT	DEP
a.	✓	$\exists \gg \textit{likely}$	$\exists \gg \textit{likely}$	✓	✓
	* (QR)	$\exists \gg \textit{likely}$	$\textit{there likely} \gg \exists$	*	*
b.	✓	$\textit{likely} \gg \exists$	$\textit{there likely} \gg \exists$	✓	*
	✓ (reconstruction)	$\textit{likely} \gg \exists$	$\exists \gg \textit{likely}$	*	✓

When the existential takes wide scope, there is only one possibility: the PF corresponding to overt movement (no expletive). This PF satisfies both ScoT and DEP. Narrow scope, however, yields a quandary. The syntactic resources of English permit the DP to remain in situ, satisfying ScoT, but this requires a costly expletive to occupy the subject position. On the other hand, overt movement in order to satisfy the EPP avoids the need for an expletive, but the cost is a ScoT violation: a PF that is nontransparent with respect to scope relations. The result is that both are possible (neither is more economical than the other). These are indeed the facts, as laid out in (24). Keep in mind, again, that our presentation of the data started with overt strings (PFs), but our analysis of the account starts from LFs. A given PF is “ambiguous” only in the sense that it happens to be the legitimate outcome for more than one LF.

There is undoubtedly far more to say about English raising and expletive constructions, and we would be surprised if the choice between the two alternatives in (26b) for the representation of narrow scope turned out to be completely “free” (see also footnote 13). We proceed on the assumption that adding other factors (topic-focus structure, etc.) to the picture presented here will pose no special challenge for our account, as opposed to competing accounts.

3.3 *English Focus and Heavy NP Shift (Williams 2003)*

Consider now one aspect of the interaction between heavy NP shift (HNPS) and focus in English. Williams (2003:34) presents the paradigm in (27) (see also Hawkins 1994). What is of particular interest to us is that there are two variables to consider: in terms of overt order, the DP object

may either precede or follow the PP; and in terms of information structure, either the DP or the PP may be (or include) the focus. Of the four possibilities, exactly three are acceptable.¹⁹ Sound familiar?

- | | | |
|---------|---|---------|
| (27) a. | John gave to Mary all of the money in the SATCHEL. | HNPS |
| b. | *John gave to MARY all of the money in the satchel. | *HNPS |
| c. | John gave all of the money in the satchel to MARY. | no HNPS |
| d. | John gave all of the money in the SATCHEL to Mary. | no HNPS |

As Williams notes, one account that can be immediately set aside treats HNPS as an obligatory operation placing focus in final position. The pair (27a) versus (27d) shows that with focus held constant, HNPS is optional; the constituent containing the focus need not be final, and thus (27b) cannot be excluded simply because focus is nonfinal. Williams argues that there is indeed a desideratum in English that focus be final, but that this is not an absolute requirement. HNPS may apply, altering the canonical order (DP>PP), but only when application of HNPS yields a better focus representation. In Williams's theory, there are various levels of representation, among which are the overt (Surface) Structure (SS), a level of Focus Structure (FS), in which the focus should be at the right periphery (in English), and a level of Case Structure (CS), in which a DP argument should precede PPs within the VP. The comparison of (27a) and (27d) shows an inherent tension: when the DP argument contains the focus, it is impossible for surface structure to be faithful to both FS and CS simultaneously, and optionality emerges. On the other hand, (27b) is faithful to neither FS nor CS; and this order, with focus as indicated, is excluded.

Williams's account finds a straightforward translation into our terms, if we broaden our notion of LF to include a representation of (topic and) focus; we will designate the relevant representation LF_{IS} (for *Information Structure*, taking no stand just yet on how the representations for scope and information structure are related to one another).²⁰ We contend, following Williams, that one aspect of (English) LF_{IS} is that the relation $X \gg \text{Foc}$ obtains, whatever '»' means at this

¹⁹ With Williams (2003), we lay aside here the role of weight (complexity) in the distribution of HNPS. It is well-established that both weight/complexity (the relative size of NP versus PP) and information structure play a significant role in determining the distribution of HNPS in a corpus (see Hawkins 1994 and especially Arnold et al. 2000). In particular, where the direct object is comparable to—or even somewhat heavier (larger) than—the PP, the corpus results reported by Arnold et al. (2000:37) bear out the paradigm presented by Williams: direct objects representing given information essentially do not occur in shifted position, while direct objects representing new information (focus) shift in roughly half of the relevant examples. This is consistent with our contention that shift of a focused NP is freely available, but not obligatory. See also Hawkins 1994, where the author presents a paradigm in relevant respects identical to (27), drawing the conclusion that weight alone is insufficient and that focus on the direct object permits, but does not force, HNPS. We again take up the general point regarding weight at the end of this subsection.

²⁰ The simplest assumption may be that scope and information structure are represented in the same level of representation—for example, as in the annotated f(ocus)-structures proposed by Erteschik-Shir (1997). If these notions are indeed represented at the same level, only one of them (we presume scope) can be instantiated hierarchically, since it is possible for the topic-focus relations and scope relations to be at odds with one another (see section 3.5), at least under the definitions of topic and focus used here (but see Erteschik-Shir 1997 and Williams 2003 for contrasting views).

level of representation.²¹ With this assumption, ScoT then fulfills the role of an SS:FS faithfulness condition, in Williams's terms: the more optimal PF representations are those in which the focus constituent is final. What, then, of the SS:CS faithfulness condition? The substantive content of this condition is to favor the order NP»PP within the VP, work that was done by Case Adjacency in early GB models (compare languages like French, in which this condition is also readily observed). Pending deeper understanding, we simply stipulate the observation as a condition that "canonical complement order" (CCO) be respected. In our terms, HNPS is thus a "free" movement (like scrambling)—it is not feature-driven or required for convergence—but it is costly, as it violates this economy condition. Leaving the DP object in its base position is preferred, all else being equal.

Table (28) shows how Williams's intuition is now recast in our system. As in the previous discussions of $\frac{3}{4}$ signatures, there are two pairwise competitions, taking a particular LF_{IS} as input and regulating the choice among competing PFs, relative to two economy conditions. Where the conditions align, there is a winner and a loser, but where the conditions conflict, optionality emerges.²²

(28) *English HNPS and focus*

		LF _{IS}	PF	ScoT	CCO
(27c)	✓	NP » PP [FOC]	NP » PP [FOC]	✓	✓
(27b)	* (HNPS)	NP » PP [FOC]	PP [FOC] » NP	*	*
(27a)	✓ (HNPS)	PP » NP [FOC]	PP » NP [FOC]	✓	*
(27d)	✓	PP » NP [FOC]	NP [FOC] » PP	*	✓

²¹ This is a lacuna in Williams's account, and thus in ours. It appears that Williams intends FS to have a linear order, so that one may speak of the focus constituent as being final at FS, even when it is not final in the surface string. Alternatively, we might take » to be a notion derivative of constituent structure (i.e., c-command), which would amount to claiming that a focus may be contained in a topic constituent, but not vice versa. This view will play an important role in our adaptation of the analysis in Neeleman and Van de Koot 2008 in section 3.4 and constitutes one reason why we invoke an isomorphism condition here (ScoT) rather than positing a more direct PF economy condition: focus-final (though that would certainly work for the cases at hand). Our approach raises nontrivial questions about the interaction of constituency and order in cases where IS and LF (scope and binding) conflict. We also do not discuss here the interaction of these constraints with focus projection and why, for example, HNPS in (27a) obligatorily pied-pipes the whole DP when only SACHEL is in focus. See section 5.2 for some remarks on focus projection within the system outlined here.

²² Note that we do not take grammatical optionality to necessarily imply "free" variation in the sense of, for example, equal distribution of the two alternatives in a corpus. Specifically, where the grammar (competence) permits two options, as in (27a–d), performance factors, such as the processing concerns cited by Hawkins (1994), may determine actual distributions, plausibly in a probabilistic manner. However, in the context of PP focus, HNPS is generally excluded regardless of the weight of the NP (see (27b)). This characterization breaks down, it seems, where the direct object is substantially larger than the PP. Arnold et al. (2000) report that even given-information direct objects shift when there is a sizable difference in size/complexity (DPs an average of 11.4 words longer than PPs, in their corpus). Although we consider weight to be a performance factor, rather than a part of the grammar, in contrast to Focus Structure isomorphism, we could also build in a (soft) constraint favoring peripherality of extraheavy constituents. The main point of this section has been to argue in favor of a constraint interaction model that yields optionality (or variability): deviation from the canonical order requires a motivation (a better isomorphism to focus, and perhaps a better phonological phrasing), but such motivations do not force operations such as HNPS. The competing conditions yield multiple grammatical PFs, among which the canonical order is always one of the possibilities. Where there is no motivation for HNPS, the canonical order is the only possibility.

3.4 Dutch $\bar{A}$ -Scrambling (Neeleman and Van de Koot 2008)

In the preceding section, we were not particularly specific about the nature of focus, as a rather loose sense was sufficient to make our point. In extending the program further, it behooves us to be more careful with notions such as focus and topic. As it happens, in doing so, we find yet another range of data in the literature that can be rather straightforwardly recast in our terms and in which yet another $\frac{3}{4}$ pattern emerges. The domain of interest is $\bar{A}$ -scrambling in Dutch, as presented by Neeleman and Van de Koot (2008; henceforth NVdK).

NVdK argue that a particular sense of topic and focus is important to understanding word order variation in Dutch.²³ For focus, it will suffice for present concerns to take the focus in a question-answer pair to be the constituent in the answer that corresponds to the *wh*-operator in the question. There may, but need not, be additional material that signals (certain subtypes) of focus, such as ‘even’ (for scalar focus) or ‘only’ (for contrastive focus).

The relevant notion of topic is narrower than often used in the literature; in particular, simple givenness (old information) does not suffice for a DP to count as a topic in the sense needed to understand scrambling patterns. Rather, what is needed is a shift in topic: a DP counts as a topic in this sense if it either narrows or otherwise changes the current discourse topic. One context that makes this usage clear is question-answer pairs where the responding party answers a different question than the one posed, shifting/changing the topic in the process (see Büring 1997a,b, 2003). Another useful diagnostic of topichood is that a topic DP cannot be replaced by a negative quantifier.²⁴ These notions are illustrated in the following mini-dialogues. The example in (29) sets up a baseline.

- (29) A: Hoe zit het met FRED? Wat heeft HIJ gegeten?
 ‘What about Fred? What did he eat?’
 B: Nou, dat weet ik niet, maar . . .
 ‘Well, I don’t know, but . . .’
 a. ik geloof dat [Wim]_T [van de BONEN]_F gegeten heeft.
 I believe that Wim from the beans eaten has
 ‘I believe that Wim has eaten (some) of the beans.’
 b. #ik geloof dat [van de BONEN]_F [Wim]_T t_F gegeten heeft.
 I believe that from the beans Wim t_F eaten has
 (NVdK 2008:278)

The focus is the constituent that answers the *wh*-word in the question—in this case, *de bonen* ‘the beans’. Speaker A’s lead-in to the question establishes *Fred* as the discourse topic and asks

²³ One may clearly dispute the validity of NVdK’s notions and/or use different terminology to describe them. Our goal here is to show that their data are amenable to an analysis within our general framework, preserving their key insights, and not to argue the pros and cons of the subtleties of competing diagnostics of topic and focus. See NVdK 2008 and references therein for relevant discussion.

²⁴ In addition, NVdK refer to intonational clues to focus structure. A contrastive focus is marked in Dutch (as in English) by a so-called A-accent (Jackendoff 1972) consisting of plain high tone (H*), often followed by a default low tone (L) (see, e.g., Büring 2003). A topic bears a B-accent (Jackendoff 1972), maximally realized as L + H* followed by a default low tone and a high boundary tone (L H%).

what he ate. B's response changes the topic to *Wim* (and thus answers a different question, namely, 'What did Wim eat?'). In this context, NVdK report that scrambling of the object across the subject is infelicitous.²⁵

The dialogue in (29) should be contrasted with the one in (30). As linear strings, the sentences in (30a–b) are the same as those in (29a–b), but the context has been changed, and the judgments are accordingly different. In this case, the subject in the response answers the *wh*-question, and it is the object that marks a change in topic. In contrast to (29b), scrambling in this context is acceptable—but notably, not obligatory. In sum, of the four possible pairings of word order to context in (29)–(30), exactly three are acceptable.

(30) A: Hoe zit het met de SOEP? Wie heeft DIE gegeten?

'What about the soup? Who ate that?'

B: Nou, dat weet ik niet, maar . . .

'Well, I don't know, but . . .'

a. ik geloof dat [WIM]_F [van de bonen]_T gegeten heeft.

I believe that Wim from the beans eaten has

'I believe that Wim has eaten (some) of the beans.'

b. ik geloof dat [van de bonen]_T [WIM]_F t_T gegeten heeft.

I believe that from the beans Wim t_T eaten has

'I believe that Wim has eaten (some) of the beans.'

NVdK argue that this paradigm is representative of $\bar{A}$ -scrambling in Dutch generally, and they propose the following account. They assume that IS representations are hierarchical, with the complement/sister of a focus interpreted as a background (relative to that focus), and the complement of a topic interpreted as its comment. This is shown in (31a).²⁶ NVdK claim moreover that focus-background structures can be part of a comment, but that topic-comment structures cannot be embedded in a background; hence, the representation in (31b) is ill-formed.

(31) *Information Structure*

a. topic [_{comment} FOCUS [_{background} . . .]]

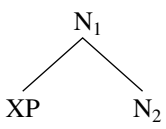
b. *FOCUS [_{background} topic [_{comment} . . .]]

NVdK next propose a pair of mapping rules, which interpret $\bar{A}$ -movement structures. With reference to the structure in (32a), the two rules are given in (32b–c). Note that a crucial assumption

²⁵ Dutch has two operations that move DPs in the clause, both discussed under the rubric of *scrambling* in the literature. One shows A-properties and the other $\bar{A}$ -properties. Only the latter, $\bar{A}$ -movement, permits the reordering of DPs; thus, the movement of the object across the subject in (29b) must be an instance of $\bar{A}$ -scrambling. Some authors reserve the term *scrambling* for the $\bar{A}$ -operation, calling the A-movement *object shift*. For general discussion of Dutch in this regard, see Zwart 1993, Neeleman 1994, and Broekhuis 2008.

²⁶ NVdK further assume that topics may iterate, but that the focus may not. This is not relevant to the examples considered here and is ignored for reasons of simplicity. Note that material in the background in the NVdK structure is more deeply embedded than the focus, which makes a straightforward extension of their hierarchical structure to the English cases discussed above difficult, without reference to linear order. See footnote 21.

in the NVdK account is that the mapping rules in (32) only apply to movement structures, that is, where XP in (32a) has undergone $\bar{A}$ -movement. We will return to this below.

- (32) a. 
- b. *Comment mapping rule*
If XP in (a) is interpreted as topic, then interpret N₂ as comment.
- c. *Background mapping rule*
If XP in (a) is interpreted as focus, then interpret N₂ as background.

The facts are then accounted for as follows. Take first the (b) examples, which involve scrambling. In (29b), the moved XP *van de BONEN* ‘from the beans’ is interpreted as a focus, and thus the mapping rule (32c) applies, mapping the remainder of the clause to its right to the background. However, this background contains a (contrastive) topic, and that is disallowed (31b). The resulting structure is therefore ill-formed, with the topic-focus interpretation as indicated. Compare this with the same word order in (30b). Here, the moved XP *van de bonen* ‘from the beans’ is interpreted as a (contrastive) topic, and thus the mapping rule (32b) applies: the comment constituent contains a focus, and this is allowed under (31); hence, in this context, the structure is well-formed. Why then is there no contrast in the (a) examples? By stipulation, the mapping rules only apply to the output of $\bar{A}$ -movement. When the word order is the base order, mapping rules fail to apply and there is no (relevant) constraint on the relative order of topic and focus. There must be some other means of mapping overt structure to IS—in NVdK’s account, mapping when there has been no movement is ‘free.’

While we think that the account is on the right track, the specific implementation leaves open an important question: why should the mapping rules care whether a particular structure is generated by movement or not? That is, why should there be two different mapping mechanisms, one for movement structures, and another for structures without movement? Our perspective, like Williams’s (2003) approach, provides an answer. The canonical (base) order among arguments is privileged in a particular sense. We assume that movement is ‘costly’ and thus requires a motivation in order to offset those costs, an assumption we expressed above as CCO (cf. the idea of movement as a last resort in Chomsky’s (1995) version of Minimalism). Movement is permitted when it provides a better reflection of some aspect of interpretation than the sentence would have without movement. In the cases at hand, just as with the *satchel* examples in (27), the topic-focus structure may or may not align with the canonical order. When the two are misaligned, movement provides a better reflection of the topic-focus relations, but the trade-off is a noncanonical, and thus costly, word order. Under our approach, such a trade-off generally results in the appearance of optionality. But in the case of (29b), there is no trade—movement is unmotivated, and hence disallowed.

Table (33) illustrates the NVdK paradigm from our perspective. The derivation is entirely parallel to the English HNPS discussion above: the relevant LF notion here is IS (where we adopt (31)—in our terms, written *TOP* » *FOC*); ScoT values faithfulness of PF to this structure; and

$\bar{A}$ -scrambling is “free” (not feature-driven or required for convergence), but costly (CCO). The now-familiar $\frac{3}{4}$ paradigm emerges again.²⁷

(33) *Dutch*

		LF _{IS}	PF	ScoT	CCO
a. LF _{IS} = A [TOP] » B [FOC]					
(29a)	✓	A [TOP] » B [FOC]	A [TOP] » B [FOC]	✓	✓
(29b)	* ($\bar{A}$ -scrambling)	A [TOP] » B [FOC]	B [FOC] » A [TOP]	*	*
b. LF _{IS} = B [TOP] » A [FOC]					
(30a)	✓	B [TOP] » A [FOC]	A [FOC] » B [TOP]	*	✓
(30b)	✓ ($\bar{A}$ -scrambling)	B [TOP] » A [FOC]	B [TOP] » A [FOC]	✓	*

3.5 Interim Summary

At this point, we have considered three domains in which $\frac{3}{4}$ patterns emerge as the result of the interaction of ScoT with another economy condition. The examples and conditions invoked are summarized in table 1.

Although we have contended that ScoT is doing the work in each case, we have used ScoT in two different, but related ways. On the one hand, we have used it to value isomorphism between linear order and LF qua quantifier scope, and on the other hand, we have taken it to enforce transparency with respect to LF qua IS. The important question to ask, then, is whether there are really two isomorphism conditions (as in Williams 2003, where a variety of isomorphism conditions relate seven or so discrete levels of representation). Of obvious relevance is the interaction between quantifier scope and information structure, when both are at issue in the same sentences.

Table 1
Constraints

Construction	Hard constraints (not violable)	Soft constraints (violable)
German, Japanese scope rigidity	Locality of QR	ScoT
English subject movement	EPP	ScoT (Q-scope), DEP
English HNPS	LF _{IS} : [. . .] » FOC	ScoT (IS), CCO
Dutch $\bar{A}$ -scrambling	LF _{IS} : TOP » FOC (universal?)	ScoT (IS), CCO

²⁷ Williams’s (2003:45–50) analysis of scope in Hungarian and its interaction with word order and focus can also be seen as a $\frac{3}{4}$ pattern and can be readily translated into our system. We note, though, that Williams’s account does not (so far as we can tell) cover all of the data points in Brody and Szabolcsi 2003, the source on which he draws. In light of this, we leave an exploration of Hungarian scope for future work.

This interaction has been explored in a detailed study of German by Wurmbrand (2008), who concludes that we are indeed correct to posit a single constraint, ScoT, that looks simultaneously at both IS and a more traditional LF (scope and binding relations). The matter is complicated by a variety of factors, including interactions with intonation, the A/ $\bar{A}$ distinction, and especially a distinction between syntactic and semantic reconstruction, to which we return in section 4. Nevertheless, once these factors are controlled for, the system sketched here seems to make delicate but apparently correct predictions even in some complicated examples. We present one representative paradigm here (for later reference), but in the interests of space, we invite the reader to consult Wurmbrand 2008 for additional facts and analysis. This paradigm illustrates the interaction of scope and information structure, from the ScoT perspective, but does not resolve the issue of whether this is one isomorphism constraint or two, tied ones.

The relevant paradigm is presented schematically in table (34). Some of the judgments are rather subtle, since it is fairly easy to make implicit accommodations to the context that alter the information structure (see also Neeleman and Van de Koot 2008 for a discussion of the methodological hurdle of this topic-focus swap). Nevertheless, on preliminary investigation it appears that the contrast predicted in (34) is detectable in (35) versus (36).

(34) *QR*

		LF	IS	PF	ScoT
Scope = IS					
(35b)	* (QR)	B»A	B [TOP] » A [FOC]	A [FOC] » B [TOP]	* (LF, IS)
(35a)	✓	B»A	B [TOP] » A [FOC]	B [TOP] » A [FOC]	✓
Scope ≠ IS					
(36b)	✓ (QR)	B»A	A [TOP] » B [FOC]	A [TOP] » B [FOC]	* (LF)
(36a)	✓	B»A	A [TOP] » B [FOC]	B [FOC] » A [TOP]	* (IS)

The first pair is presented in a context where the subject is in focus and the object is the topic. When we consider the reading in which the existential is in the scope of the universal, there is a contrast in acceptability between the word orders, movement of the object across the subject (35a) being preferred.²⁸ This is a simple case of scope rigidity; in this case, the scope relation (B»A) and the IS relation (B [TOP] » A [FOC]) align with one another, and the PF that reflects these transparently wins (see the first two rows of (34)).²⁹

²⁸ The order in (35b) is acceptable with surface scope of the existential over the universal. This sentence allows inverse scope in the context in (35) only if the information structure is adjusted roughly to ‘‘I don’t know the answer to your question, but if we are speaking of pupils . . .’’—that is, when the subject (A) is turned into a topic. Needless to say, further research is necessary to find ways to better control for this interfering factor.

²⁹ The examples are given as main clauses to reduce expository complexity. A valid question is how verb-second (V2) movement interacts with ScoT (thanks to Danny Fox for pointing this out). The data in this article suggest that V2 has no additional effect on scope or information structure (see, e.g., Fanselow 2004, Fanselow and Lenertová 2011) and that it can in effect be ignored for the purposes of ScoT. This effect can be captured if we maintain—as we have

(35) A: Jetzt zu den Gedichten. Wer hat jedes Gedicht gelesen?

‘Let’s talk about the poems. Who read every poem?’

B: Das weiß ich nicht, aber . . .

‘I don’t know, but . . .’

A [FOC]; B [TOP]

Intended scope: B»A

a. jeden Roman hat mindestens ein Schüler gelesen.

every novel (B) has at least one pupil (A) read

‘at least one pupil read every novel.’

A»E

b. mindestens ein Schüler hat jeden Roman gelesen.

at.least one pupil (A) has every novel (B) read

‘at least one pupil read every novel.’

#A»E

However, if we reverse the alignment of topic and focus to subject and object, we are left with a scenario in which the PF cannot be simultaneously transparent to both the LF (scope) and the IS. ScoT will be violated no matter which PF is chosen. In precisely this context, both word orders are acceptable as a means to express the reading in which the focus takes scope over the topic.

(36) A: Jetzt zu den Studenten. Was hat mindestens ein Student gelesen?

‘Let’s talk about the students. What did at least one student read?’

B: Das weiß ich nicht, aber . . .

‘I don’t know, but . . .’

A [TOP]; B [FOC]

Intended scope: B»A

a. jeden Roman hat mindestens ein Schüler gelesen.

every novel (B) has at.least one pupil (A) read

‘at least one pupil read every novel.’

A»E

throughout—that scrambling/QR targets particular nodes, such as vP or TP and that there is a step of scrambling of the object across the subject in examples such as (35a–b). We must further assume that ScoT determines the relative PF order among DPs within the complement of C⁰, prior to the application of V2, and that V2 movement is order-preserving with respect to the relative order among DPs. The model of cyclic linearization proposed by Fox and Pesetsky (2005) has (almost) the right properties to allow this to be formalized. The claim that V2 movement is triggered by an EPP-like feature rather than (solely) by information structure properties is argued for convincingly by Fanselow (2004) and Fanselow and Lenertová (2011). Furthermore, Fanselow and Lenertová (2011) suggest that V2 movement is constrained by accentuation. Given that accentuation is only an issue for overt elements, this observation lends support to the assumption that V2 is sensitive to PF properties, such as overtness of copies.

- b. mindestens ein Schüler hat jeden Roman gelesen.
 at.least one pupil (A) has every novel (B) read
 ‘at least one pupil read every novel.’

$\forall \gg \exists; \exists \gg \forall$

Note importantly that (36) emerges, as we predict, as one environment in which QR becomes available in German. QR is licensed here under the $\frac{3}{4}$ effect logic: since scope and IS conflict, the surface order can only be faithful to one; when the surface order is faithful to IS, inverse scope is thereby permitted (as in (36b)).³⁰

4 Reconstruction

4.1 Possible and Impossible Reconstruction

In table (3), we indicated that ScoT rules out an LF-PF mismatch corresponding to reconstruction in languages such as German and Japanese. In this section, we motivate this claim and show that it is correct as far as syntactic reconstruction is concerned. To do so, we summarize the major reconstruction facts in German and Japanese, and also compare them with the facts in English.

A common characterization of scrambling in German and Japanese is that only $\bar{A}$ -scrambling (also referred to as long/medium scrambling or IP-scrambling) can reconstruct ((37a) for German, (37b) for Japanese), whereas A-scrambling (short or VP-) does not reconstruct (examples in (38); see, e.g., Frey 1989, Haider 1989, Saito 1989, 2003, Mahajan 1990, Nemoto 1993, Tada 1993, Lasnik 1999).³¹

- (37) a. weil dieses Bild von sich_i der Hans_i seinen Freunden t_{ACC} schenken wollte
 since this picture of himself the Hans his friends t_{ACC} give wanted
 ‘since Hans wanted to give this picture of himself to his friends as a gift’
 (Lechner 1998b:297)
- b. Otagai-o_i [Taroo-to Itiroo]_i-ga Mari-ni t_{ACC} syookaisita.
 each.other-ACC Taro-and Ichiro-NOM Mari-DAT t_{ACC} introduced
 ‘Taro and Ichiro introduced each other to Mari.’
 (Yamashita, to appear)

³⁰ Erteschik-Shir (1997) (see also Williams 2003) argues that scope is directly read off IS and that topics always have wide scope. While this appears to be at odds with the data in (36), Erteschik-Shir’s definitions of topic and focus are importantly different from those of NVdK, used here. As we understand the discussion in Erteschik-Shir 1997: 182–183, she distinguishes between an unexpressed topic-set (available for students/pupils and novels alike) and the contrastive foci picked out by the quantificational NPs. The addition of the quantifier *mindestens ein* ‘at least one’ in (36) thus has the effect that neither NP is the topic in such examples, in Erteschik-Shir’s terms. Williams (2003) offers less nuance in his definition of topic, and the examples in (36) therefore seem to challenge his claim that topics (broadly construed) always have wide scope.

³¹ There are certain differences between German and Japanese regarding examples such as (38a), which we cannot address here.

- (38) a. weil sie [ein Bild von seinem_i Auftritt] [jedem Kandidaten]_i t_{ACC} zeigte
 since she a.ACC picture of his appearance every.DAT candidate t_{ACC} showed
 ‘since she showed a picture of his appearance to every candidate’
 $\exists \gg \forall$; $\forall \gg \exists$; in both interpretations, variable binding of ‘his’ by $\forall$ is impossible
 (Lechner 1998b:299)
- b. *Taroo-ga otagai-o_i [Mari-to Hanako]_i-ni t_{ACC} syookaisita.
 TarO-NOM each.other-ACC Mari-and Hanako-DAT t_{ACC} introduced
 ‘Lit. Taro introduced each other to Mari and Hanako.’
 (Yamashita, to appear)

It is also well-known, yet often ignored, that the lack of A-reconstruction only concerns binding; in both Japanese and German, A-movement does allow reconstruction for scope. As Lechner (1996, 1998a,b) points out, this split is particularly striking in (38a) (see the works just cited for further examples making the same point), since, despite disallowing reconstruction for binding, this example is nevertheless scopally ambiguous. The accusative QP can take scope under the dative QP, but even under this interpretation, a bound variable interpretation of the pronoun in the moved QP is impossible. As Hoji (1985) has already noted, the same is true for Japanese. A-movement *does* show reconstruction effects for scope, as shown in (39), which involves short scrambling yet scope ambiguity.

- (39) Taroo-ga huta-ri-no otoko-o san-nin-no onna-ni t_{ACC} syookaisita.
 TarO-NOM 2-CL-GEN men-ACC 3-CL-GEN women-DAT t_{ACC} introduced
 ‘Taro introduced two men to three women.’
 (Hoji 1985:258) 2>3; 3>2

In contrast to the facts in German and Japanese, A-reconstruction (for variable binding, as well as scope) is possible in English (for arguments, see Fox 1999, 2000, 2003, Wurmbrand and Bobaljik 1999). As shown in (40a), a pronoun embedded in an A-moved subject can be bound by a lower quantified indirect argument. Since, in contrast to cases such as (40b), where there is no trace of the subject below the indirect argument, no Weak Crossover violation arises, this variable binding relation must be the result of reconstruction of the subject rather than QR of the universal QP across the subject.

- (40) a. Someone from his_i class seems to every professor_i t_{SUBJ} to be a genius.
 (Fox 1999:161)
- b. ??Someone from his_i class shouted to every professor_i to be careful.

Although these facts have received accounts in the literature, there is no uniform account explaining the entire distribution of (37) through (40). We propose that the ScoT model, supplemented with semantic reconstruction, allows us to provide an answer to the following questions: Why does A-movement in English reconstruct for both scope and binding, but A-scrambling only for scope? Why does $\bar{A}$ -scrambling reconstruct for scope and binding, but A-scrambling only for scope?

The ScoT model immediately predicts that reconstruction for binding is impossible in German and Japanese A-scrambling (see (3b)). The relevant derivations for (38b) are given in more detail in (41). If the reconstructed (DAT>ACC) LF is intended (as required to meet Condition A), ScoT rules out the nonmatching (ACC>DAT) PF in (41)/(38b). That PF will only be licensed as a PF corresponding to an LF ACC>DAT (which is problematic in a sentence like (41)/(38b), since in that case Condition A cannot be met).

- What about scope reconstruction in A-scrambling contexts, then? To account for the mismatch between reconstruction for scope and reconstruction for binding, we follow Cresti (1995), Rullmann (1995), Sharvit (1999), and in particular Lechner (1996, 1998a,b) in assuming the existence of semantic (in addition to syntactic) reconstruction. Under a semantic reconstruction approach, traces (or in the current framework, nonprivileged copies) can be interpreted (in semantics) as higher types (see (42)), yielding the effect of scope reconstruction, but *without* actual reconstruction of the quantifier at LF.³²

- A full derivation for (38a) making use of semantic reconstruction is given in (43). As before, in German, ScoT only allows a PF that matches the intended LF; hence, reconstruction for binding (an LF phenomenon) is ruled out as in (41). The only way the PF in (38a)/(43) can be licensed is under an LF like the one in (43c)—that is, an LF that does not allow a bound variable interpretation of ‘his’. However, at the LF-semantics interface, a higher type interpretation is available for

³² Following Fox (1999, 2000) and Sauerland (1998), we assume that nonprivileged copies are not simply deleted at LF, but interpreted after various trace conversion operations apply. Semantic reconstruction amounts to the assumption that there is more than one logical type available as the output of trace conversion.

nonprivileged copies of quantifiers, resulting in the effect of scope reconstruction, by nevertheless prohibiting syntactic reconstruction.

- (43) weil sie [ein Bild von seinem_i Auftritt] [jedem Kandidaten]_i t_{ACC} zeigte
 since she a.ACC picture of his appearance every.DAT candidate t_{ACC} showed
 ‘since she showed a picture of his appearance to every candidate’
 (Lechner 1998b:299)

$\exists \gg \forall$; $\forall \gg \exists$; in both interpretations, variable binding of ‘his’ by $\forall$ is impossible

- a. Syntax (base): [every candidate] [a pic ... his] showed
 b. A-scrambling: [a pic ... his] [every candidate] [a pic ... his] showed
 c. LF: [a pic ... his] [every candidate] [~~a pic ... his~~] showed
 d. PF: [a pic ... his] [every candidate] [~~a pic ... his~~] showed $\checkmark$ ScoT
 e. Semantics: [a pic ... his] [every candidate] T $\langle\langle e, t \rangle, t \rangle$ showed

Note that the LF in which [ein Bild von seinem_i Auftritt] is c-commanded by [jedem Kandidaten]_i and pronoun binding is possible is in principle a licit LF, but because of ScoT, that LF necessarily corresponds to the surface order in (44), not (43).

- (44) weil sie [jedem Kandidaten]_i [ein Bild von seinem_i Auftritt] zeigte
 since she every.DAT candidate a.ACC picture of his appearance showed
 ‘since she showed a picture of his appearance to every candidate’

Before turning to A-reconstruction in English, let us briefly compare the ScoT-based account with other accounts of the lack of reconstruction in A-scrambling contexts. An often-cited view is Lasnik’s (1999) claim that A-movement does not leave a trace. However, this approach fails to account for scope reconstruction, where reconstruction does occur (cf. Wurmbrand and Bobaljik 1999). Since semantic reconstruction is only possible when there is a trace that can be interpreted as a higher-type trace, the availability of semantic scope reconstruction entails the presence of a trace in A-movement contexts. Hence, Lasnik’s claim is untenable. Similarly, the possibility of scope reconstruction is mysterious in accounts that deny the existence of short scrambling and assume that both orders, DAT $\gg$ ACC and ACC $\gg$ DAT, are base-generated. Under these structures, too, there is no trace that could be interpreted as a higher-type trace; hence, scope reconstruction remains unaccounted for.

Finally, ScoT, together with an independently motivated property of English, straightforwardly explains why A-reconstruction is available in English. As pointed out in section 3.2, English is subject to the EPP, as classically understood: the requirement that Spec,IP must be filled at PF. We further assume that the EPP is a hard constraint, which, if not satisfied, causes the derivation to crash. The derivation for a sentence involving A-reconstruction in English is given in (45). The subject moves overtly to the matrix subject position (to check features with T). At LF, the lower copy must be chosen to achieve a bound variable interpretation of the pronoun embedded in the subject. At PF, however, there is no choice in English: a ScoT-satisfying PF where the lower copy of the subject is pronounced is excluded since the resulting PF would violate the EPP (for the derivations involving *there*-insertion, see section 3.2). For the derivation to converge, the higher copy must be pronounced, even though this PF ordering violates ScoT.

- (45) Someone from his_i class seems to every professor_i t_{SUBJ} to be a genius.
- a. Syntax: seems to every professor to be [someone . . .] a genius
 - b. A-movement: [*someone* . . .] seems to [every prof] to be [*someone* . . .] a genius
 - c. LF: [~~*someone*~~ . . .] seems to [every prof] to be [*someone* . . .] a genius
 - d. *PF1: [~~*someone*~~ . . .] seems to [every prof] to be [*someone* . . .] a genius
- *EPP
- PF2: [*someone* . . .] seems to [every prof] to be [~~*someone*~~ . . .] a genius
- *ScoT tolerated

To conclude, in this section, we argued that the ScoT account, together with the possibility of semantic reconstruction and certain independently motivated constraints (the EPP, a constraint that disfavors expletive insertion, and a language-specific setting for scrambling), derives the basic distribution of reconstruction in A-movement contexts in English, German, and Japanese.

4.3 $\bar{A}$ -Reconstruction

The last question to address is why $\bar{A}$ -scrambling allows reconstruction for binding in German and Japanese. At first, ScoT seems to make the wrong prediction here; as in the case of A-scrambling, syntactic reconstruction should be unavailable, given the existence of a more economical matching PF. However, a quick detour to QR in German will show that there is an interfering factor, which will allow us to distinguish A- from $\bar{A}$ -scrambling and derive the difference in syntactic reconstruction.

Although German is typically considered to be a scope-rigid language, it is also well-known that inverse scope is possible in subject»object contexts when a special (rise-fall) intonation is used (Jacobs 1982, 1983, 1984, Lötscher 1984, Löbner 1990, Höhle 1992, Féry 1993, Büring 1997a,b, Krifka 1998, Sauerland and Bott 2002).

- (46) weil mindestens /EIN Student \JEDen Roman gelesen hat
 since at.least one student every novel read has
 ‘since at least one student read every novel’
- $\exists \gg \forall; \forall \gg \exists$

Following Büring (1997a,b), we assume that the special intonation represents a TOPIC»FOCUS accent. We are now in a position to put the insights gained in sections 3.3 and 3.4 together to account for the availability of inverse scope in German under the special intonation. First, ScoT (somewhat a misnomer now) picks the best PF match for both IS and LF (as in Williams 2003). Second, IS orders TOPIC before FOCUS (e.g., Neeleman and Van de Koot 2008). The derivation of (46) is given in (47).

- (47) a. Syntax: [a student]_{TOP} [every novel]_{FOC}
- b. QR: [every novel]_{FOC} [a student]_{TOP} [every novel]_{FOC}
 - c. LF: [every novel]_{FOC} [a student]_{TOP} [~~every novel~~]_{FOE}
 - IS: [~~every novel~~]_{FOE} [a student]_{TOP} [every novel]_{FOC}
 - d. PF1: [every novel]_{FOC} [a student]_{TOP} [~~every novel~~]_{FOE} *ScoT (IS)
 - PF2: [~~every novel~~]_{FOE} [a student]_{TOP} [every novel]_{FOC} *ScoT (LF)

To end up with a wide scope reading of the object, overt QR has to apply as in (47b). Typically, as discussed above, ScoT then favors a PF that matches the LF, yielding rigidity effects. However,

once the scope of ScoT is extended to IS, there is one special case in which ScoT does not force a PF that matches the LF, even in a scrambling language like German. That special case is a context in which the intended IS and the intended LF yield the opposite orders, exactly as in (47c). In this case, the IS order is subject (TOPIC) » object (FOCUS), whereas the LF (scope) order is object » subject. Assuming that ScoT compares PF with both LF and IS, there is then simply no PF that will be a better match than the other; that is, each PF in (47d) will be nonisomorphic to one representation, LF or IS. Since neither PF order is better or worse than the other, both orders are licensed.³³

Returning to $\bar{A}$ -reconstruction, we suggest that the availability of syntactic reconstruction in $\bar{A}$ -scrambling contexts is also the result of a mismatch between the LF scope order and the IS of these examples. Specifically, in $\bar{A}$ -movement contexts such as (48), in contrast to the A-movement contexts discussed in section 4.2 (but see below), the moved element is interpreted as a TOPIC (see also Neeleman 1994). Thus, in (48a), movement of the object to the left of the subject creates an optimal IS configuration TOPIC»COMMENT/FOCUS. Assuming again that ScoT aims at aligning word order with LF scope on the one hand and with IS on the other, examples such as (48) create a ScoT conflict: there is no word order that will perfectly match both LF and IS, and as a result, both PFs are licensed.³⁴

- (48) weil seinen_i Sohn jeder Vater_i t_{ACC} liebt
 since his.ACC_i son every.NOM father_i t_{ACC} loves
 ‘since every father loves his son’
- a. Syntax: [every father] [his son]_{TOP} loves
 b. Scrambling: [his son]_{TOP} [every father] [his son]_{TOP} loves
 c. LF: [~~his son~~]_{TOP} [every father] [his son]_{TOP} loves
 IS: [his son]_{TOP} [every father] [~~his son~~]_{TOP} loves
 d. PF1: [~~his son~~]_{TOP} [every father] [his son]_{TOP} loves *ScoT (IS)
 PF2: [his son]_{TOP} [every father] [~~his son~~]_{TOP} loves *ScoT (LF)

Note that in this account, the syntactic distinction between A- and $\bar{A}$ -movement (e.g., the landing site) is effectively irrelevant. Rather, reconstruction is possible whenever overt movement yields a ‘better’ IS. Contrary to previous views, which simply stipulate that A- and $\bar{A}$ -movement differ regarding their syntactic reconstruction potential (and as a result, short scrambling must be A-movement, whereas medium/long scrambling must be $\bar{A}$ -movement), the current approach

³³ This analysis predicts that the scope options will be different in contexts where the topic/focus relations are reversed. See Wurmbrand 2008 for initial support for this prediction and further discussion.

³⁴ Although the relevance of information structure properties is well-documented for German QR and reconstruction, the exact definition of what counts as a topic is somewhat controversial. We have basically followed NVdK’s (2008) definition, which is sufficient for covering the German facts. However, this definition might be too narrow, and further investigation of the information structure properties is necessary, in particular if the account is to be extended to Japanese. Thanks to Satoshi Tomioka for reinforcing the importance of this point.

provides an independent property distinguishing between (so-called) A- and $\bar{A}$ -movement: the information structure properties (see also Neeleman 1994, Neeleman and Van de Koot 2008). It is therefore predicted that when the information structure is set up differently and the TOPIC/ FOCUS properties are changed, the A/ $\bar{A}$ distinction should be overridden and the effects of reconstruction should change. There are two pieces of evidence showing that this prediction is on the right track.

First, it is predicted that short VP-scrambling (normally characterized as A-scrambling) should pattern with $\bar{A}$ -scrambling and also allow syntactic reconstruction, as long as the moved element is clearly interpreted or marked as a topic. Initial testing with a number of German speakers confirms this prediction. Marking examples such as (38a) with a clear TOPIC-FOCUS intonation (Büring 1997a,b, Krifka 1998) changes the reconstruction pattern. In contrast to (38a), a bound variable interpretation where ‘his’ is bound by the universal quantifier is available in (49).

- (49) weil sie [_{/EIN Bild von seinem_i Auftritt}]_{TOP} [_{JEDEM Kandidaten}]_{FOC} _{t_{TOP}} zeigte
 since she a.ACC picture of his appearance every.DAT candidate _{t_{TOP}} showed
 ‘since she showed a picture of his appearance to every candidate’

Second, it is predicted that if the accusative argument in (48) is (clearly) not interpreted as a topic, reconstruction should be impossible, even in an ostensibly $\bar{A}$ -movement configuration. The questions in (50) are intended to set up such a context. While judgments are subtle for these examples, and better ways need to be developed to ensure that they have the relevant information structure properties, there is clearly a contrast between the orders in (50a) and (50b), which confirms the initial plausibility of the analysis proposed here.³⁵

- (50) A: Was ist mit den Müttern? Wen glaubst du liebt jede Mutter?
 ‘What about the mothers? Who do you think every mother loves?’
 B: Das weiß ich nicht, aber ich bin sicher . . .
 ‘I don’t know, but I’m sure . . .’
 subject (TOPIC) » object (FOCUS)
- a. dass [_{jeder_i Vater}]_{TOP} [_{seinen_i Sohn}]_{FOC} liebt.
 that [_{every.NOM father}] [_{his.ACC son}] loves
 ‘that every father loves his son.’ ✓/bound variable
- b. #dass [_{seinen_i Sohn}]_{FOC} [_{jeder_i Vater}]_{TOP} _{t_{FOC}} liebt.
 that [_{his.ACC son}] [_{every.NOM father}] _{t_{FOC}} loves
 ‘that every father loves his son.’ ???bound variable

³⁵ See also the discussion of (35) and (36). One complication is that it is fairly easy to make implicit accommodations to the context that will alter the IS. For instance, (50b) would be entirely fine if the object were changed into a topic by the second speaker along these lines:

(i) A: What about the mothers? Who do you think every mother loves?
 B: I don’t know, but if we’re talking about sons, I’m sure . . .

(See also NVdK 2008 for a discussion of the methodological hurdle of this topic-focus swap.)

Table 2

Key constraints

Construction	Constraints
A-movement in English	ScoT, EPP (hard), DEP (soft)
$\bar{A}$ -/topic scrambling	ScoT (LF and IS)
A-/nontopic scrambling	ScoT; semantic reconstruction
Scope rigidity	ScoT; independent PF properties of a language ($\pm$ scrambling . . .)

Thus, in the manner just discussed, the ScoT-based approach has interesting consequences not only for the theory of reconstruction but also for the distinction between A- and $\bar{A}$ -scrambling. Although there are various accounts of this distinction in the literature, the main difference in the reconstruction behavior has typically been stipulated. The difference between (38a) and (49), as well as the difference between (48) and (50), shows that a simple syntactic (i.e., structural) definition of A- versus $\bar{A}$ -movement is not sufficient to explain the scope properties. Rather, the possibility versus impossibility of syntactic reconstruction needs to be closely tied to information structure properties. It would, of course, be possible to redefine A- versus $\bar{A}$ -movement via topic (or other information structure) properties. However, this would still leave open the questions of why $\bar{A}$ -/topic scrambling reconstructs but A-/nontopic scrambling does not (and it would not explain why A-movement in English does reconstruct). The ScoT approach, on the other hand, provides a uniform answer to all of these questions.

To conclude, in this section, we have argued that the ScoT model provides a more accurate account of the distribution of reconstruction with scrambling than traditional accounts relying on a structural A/ $\bar{A}$ distinction. The main conclusion we have reached is that reconstruction is possible whenever overt movement (whether A- or $\bar{A}$ -) yields a ‘‘better’’ IS. If the moved element is interpreted as a topic, syntactic reconstruction is possible; if the moved element is not interpreted as a topic, syntactic reconstruction is impossible.

This concludes our discussion of the main properties of the system we propose, and the account of the possible and impossible correlations between PF orders and aspects of meaning (IS, binding, and scope). Crucial to our account is the assumption that competition is LF-privileging, in the sense that alternative word orders compete to realize a given LF (or LF-IS pairing). In the next section, we engage a related, alternative framework that takes the opposite view: namely, that economy competitions begin with a specific PF representation and regulate the range of possible meanings assignable to that PF.

Table 2 summarizes the key assumptions we have made in this section and how they are relevant to the constructions and properties discussed above.

5 LF First

Above, we have presented a case for recognizing a signature pattern reflecting the interaction of two economy conditions. The distinctive pattern consists of paradigms in which three of four

logical possibilities are grammatical. Crucial to our account of these patterns is the assumption that the choice of PF is relative to a particular LF. This is compatible with theories in which PF “spells out” LF (Bobaljik 1995, 2002, Brody 1995, Groat and O’Neil 1996, Pesetsky 1998), but is at odds with approaches that start from a given surface (i.e., overt) structure and determine the LFs available to it. Notable in this latter group is in Reinhart’s (2005) Interface Economy model, with which our proposal otherwise shares a general perspective. We turn now to a comparison with that approach, and an attempt to defeat the arguments Reinhart presents in favor of a PF-first approach to economy computations. Reinhart discusses two operations in particular: QR and focus projection in English. We examine these in turn, arguing that neither provides a compelling motivation for taking the reference set to include varying LFs—the results can be directly implemented in a framework with our general architectural commitments.

5.1 *Interpretive Economy and QR*

Reinhart (2005), drawing on work by Fox (1995, 2000), presents an economy model intended to account for some restrictions on QR in English. In Reinhart’s model, competing derivations are evaluated relative to an economy condition that licenses QR only if it generates an interpretation distinct from the interpretations available without QR (cf. Fox’s Scope Economy). Reinhart’s model appears to conflict with ours, in that the *reference set* for the economy competition consists of a set of representations, each a pairing of a PF and an LF, where the PFs (overt structure) are held constant and the LFs differ (specifically, with respect to whether QR has or has not applied). In our model, derivations with distinct LFs do not compete with one another; the $\frac{3}{4}$ signature effects would not arise (or not in the form that they do) if ScoT were not asymmetric and LF-privileging.

Closer inspection, though, reveals the apparent conflict here to be an artifact of the presentation. Specifically, as Fox (2000) discusses, the real work being done by Scope Economy can be (or perhaps must be) done in the “narrow syntax.” Scope Economy, in Fox’s presentation, relates two stages in a possible derivation. It is a condition that applies locally during the course of a derivation and determines whether or not a particular operation may apply at that point in the derivation. In a GB-style architecture, in which covert operations (including QR) necessarily apply after overt word order is determined (“Spell-Out”), Reinhart’s ordering is more or less forced; Scope Economy, even construed derivationally, will determine a choice among competing LFs derived from a shared surface structure. To the extent that the determination of PF from surface structure is trivial, this amounts to a reference set with a shared PF and divergent LFs. The GB architecture is, however, no longer the “only game in town,” and a variety of alternative models have been presented in which (some) covert movement may precede (some) overt movement. One way of implementing this ordering invokes the copy theory of movement and treats “covert” movement as regular syntactic movement, but movement where the lower (rather than the higher) copy is pronounced (see Bobaljik 1995, 2002, Brody 1995; for arguments that QR works in this manner in English, see Fox and Nissenbaum 1999). By invoking the copy theory approach to covert movement, we can carry the Scope Economy paradigms over without change

into the general architecture we propose here. The appearance of an incompatibility with Reinhart's framework in particular arises for the most part when one takes the overt PF as a stand-in for the level of representation (stage of derivation) immediately preceding QR (e.g., S-Structure in the GB model). While this simplifies exposition, there is no compelling reason to incorporate this assumption into the theory. Without it, there is no conflict. In what follows, we spell out some details of this topic and then note a real point of variation between our approach and the Fox-Reinhart approach, presenting preliminary results that we believe indeed go our way.

5.1.1 Scope Economy Paradigm cases illustrating Scope Economy are examples like these (see Fox 2000):

- (51) a. A doctor will examine every patient. ambiguous
 b. A doctor will examine every patient, and Lucy will, too. unambiguous

Example (51a) is a typical case of QR (in English) where an inverse scope reading is available.³⁶ However, a puzzle originally noted by Sag (1976) and Williams (1977) is that the inverse scope reading available in (51a) disappears when this sentence forms the first part of a (certain type of) ellipsis structure, as in (51b). Fox's account of this paradigm has two pieces. The first is a(n inviolable) *Parallelism* constraint, requiring that the scope relations in the two conjuncts track one another. This is independently necessary, as (52) shows. This sentence is ambiguous, but only in two of four possible ways. If the universal takes scope over the existential in the first conjunct, then the universal must also be interpreted as taking scope over the existential in the second conjunct. Conversely, surface scope in the first conjunct entails surface scope in the second conjunct. Mismatches are disallowed.

- (52) A doctor will examine every patient, and a nurse will too.
 Possible: $\exists$ doctor » $\forall$ patient & $\exists$ nurse » $\forall$ patient
 $\forall$ patient » $\exists$ doctor & $\forall$ patient » $\exists$ nurse
 Impossible: $\exists$ doctor » $\forall$ patient & $\forall$ patient » $\exists$ nurse
 $\forall$ patient » $\exists$ doctor & $\exists$ nurse » $\forall$ patient

In addition to Parallelism, Fox proposes an economy condition: Scope Economy. This condition permits QR only if it generates an interpretation the sentence (or conjunct) would not otherwise have. In a sentence like (53), there is only one scope-bearing element, the object, and so QR of *every patient* across the subject will generate no distinct interpretation. Scope Economy excludes QR in this sentence.

³⁶ In our discussion of Fox's and Reinhart's proposals, *QR* is taken to refer to "optional" or "long" QR, driven by scope considerations, as opposed to QR that is required by the grammar, for example, to resolve type mismatch for a quantifier in object position. As Fox (2000) notes throughout, it is important to keep these types of QR distinct, and Scope Economy constrains only "optional" or "long" QR. In the interests of space, we make various other simplifications in the discussion below. See Fox 2000 for discussion.

(53) Lucy will examine every patient.

These two assumptions thus serve to derive the pattern in (51). In (51a), QR of the object across the subject derives a logically distinct interpretation and is therefore permitted (the same holds for (52)). However, in (51b), QR is blocked in the second conjunct, since the subject is not quantificational (see (53)). While QR would otherwise be available in the first conjunct, in this particular circumstance applying QR in the first conjunct but not in the second would violate Parallelism.

In Fox's (2000) elegant account of this puzzle, Reinhart (2005) sees an argument for a model that our assumptions conflict with. Specifically, Reinhart holds that the calculation involves competition among the members of a reference set consisting of derivations (LF-PF pairs) with a common PF but different LFs. This is the opposite of what we maintain: our interface economy condition (ScoT) regulates competitions with a common LF and chooses among competing PFs to express that LF. So if Reinhart's interpretation of these effects is correct, our approach will be in trouble.

However, as Fox argues, all of the effects of Scope Economy can be calculated locally (i.e., within "narrow syntax" in Minimalist terms). Scope Economy compares two derivations sharing the same numeration and differing only in the presence or absence of QR. It may thus be stated purely as a syntactic economy condition, with only limited knowledge about the interpretation of syntactic structures. By way of illustration, consider the representation in (54), an intermediate stage in a syntactic derivation. At this point in the derivation, since an IP node has been introduced that is a possible landing site for QR, it must be determined whether QR does or does not apply.

(54) [_{IP}[_{DP} SUBJ] will [_{VP} examine [_{DP} every patient]]]

Scope Economy may apply at this stage and must make one calculation. It must check whether the quantifier in the object position (the one to undergo QR) is scopally noncommutative with the subject DP. If the subject DP is a nonquantificational DP or a universal quantifier, then Scope Economy will block QR at this point. On the other hand, if the subject DP is, say, an existentially quantified DP, then QR will be allowed (but not forced). At this point, there is a fork, and two distinct derivations will continue, one in which QR applied and one in which it did not, yielding distinct LFs. In our model, it is these LFs that serve as the input to the ScoT competition, which determines the appropriate PF form for each admissible LF. For this reason, together with whatever accounts for the lack of scrambling in English, the inverse and surface LFs (QR and no QR) will receive identical pronunciations (see (6)). Representations that violate Scope Economy (by containing illicit applications of the syntactic operation QR) are simply not part of the input to ScoT. As it happens, QR in English is "covert" in the sense that the copy in the higher (moved) position is unpronounceable. Scope Economy is a derivational, syntactic constraint, while ScoT is a representational constraint on LF-PF pairings.

5.1.2 Economy and Overttness: A Prediction There is one point on which our model does differ from the implementation of Scope Economy as put forward by Fox (2000) and Reinhart (2005), and which should yield a testable prediction. Testing this prediction has proven to be extremely

delicate, but we believe that the contrasts we have looked at support our proposals. The question has to do with the range of Scope Economy and the overt/covert distinction. Fox and Reinhart explicitly propose that Scope Economy only restricts covert operations (see in particular Fox 2000:74–76). However, in light of the preceding discussion, it should be clear that we make no such prediction. For us, Scope Economy is a constraint applying in the syntactic derivation (which culminates in an LF representation) and applies before that representation is matched to PF. To the extent that overt scrambling (in German and Japanese) is a proper analogue of QR, Scope Economy should constrain *overt* application of quantifier movement, just as much as it will restrict *covert* application thereof. However, this prediction is qualified, in that Scope Economy should only constrain movement whose sole effect (or motivation) is to establish a new scope relation. Very loosely put: the topic-focus relationships that enter into the evaluation of scrambling (via ScoT) will serve as “new interpretations” in the sense that is relevant to bleed the restrictive nature of Scope Economy. Thus, the effects of Scope Economy on overt movement will be detectable only when topic/focus considerations are very carefully controlled for. The following examples constitute an attempt to test this prediction for German; the preliminary results appear to go our way, but as noted above (see also footnote 28) the judgments are delicate (see Wurmbrand 2008 for related paradigms and discussion).

As a baseline example, consider (36a), repeated here.

(36) A: Jetzt zu den Studenten. Was hat mindestens ein Student gelesen?

‘Let’s talk about the students. What did at least one student read?’

B: Das weiß ich nicht, aber . . .

‘I don’t know, but . . .’

A [TOP]; B [FOC]

Intended scope: B»A

a. jeden Roman hat mindestens ein Schüler gelesen.

every novel (B) has at least one pupil (A) read

‘at least one pupil read every novel.’

VAE

This example shows that movement is permitted even where it makes the topic»focus isomorphism worse, but where (as predicted) this order more transparently reflects the scope relations. It is precisely in this type of context where we expect the effects of Scope Economy to appear. That is, since the object movement in (36a) is permitted solely for the purpose of establishing a quantifier scope distinct from the base order (subject»object), such movement should be prohibited in a context that is otherwise analogous to (36a), but in which the subject is nonquantificational. This appears to be correct: (55b) is less felicitous in this context than the unscrambled version.³⁷

³⁷ See also Williams 2003 for a similar conclusion; but note that the qualification in footnote 28 regarding the judgment applies equally here.

- (55) A: Was ist mit dem Hans? Was hat er gelesen?
 ‘What about Hans? What did he read?’
 B: Das weiß ich nicht, aber . . .
 ‘I don’t know, but . . .’
 a. der Leo hat jedes Feuerwehrbuch gelesen.
 the Leo (A) has every fire.truck.book (B) read
 ‘Leo read every fire truck book.’
 b. #jedes Feuerwehrbuch hat der Leo _{t_{OBJ}} gelesen.
 every fire.truck.book (B) has the Leo (A) _{t_{OBJ}} read
 ‘Leo read every fire truck book.’

The key contrast here is between (55b) and (36a). Both show overt movement of a quantified focus across an in-situ topic; the contrast in acceptability arises since it is only in (36a) that this movement finds a motivation from establishing a quantifier scope relationship that is logically distinct from the unmoved counterpart.

Note that if our initial assessment of the (rather subtle) judgments is correct, we can push this prediction one step further. As Fox (2000) shows, Scope Economy blocks QR of a quantifier across another quantifier in case the two are scopally commutative. In other words, Scope Economy is not simply a ban on movement of a quantifier across a nonquantificational NP; rather, the logical properties of the quantifiers come into play. If we are right, then this should happen in the overt movement cases as well. Replacing the in-situ subject in examples like those just considered with a universally quantified DP, for example, should pattern with (55b) and not (36a) and fail to license the movement. This prediction appears to be correct, as the minimal pair in (57) and (58) illustrates.

- (56) A: Was ist mit den Buben? Was haben die gelesen?
 ‘What about the boys? What did they read?’
 B: Das weiß ich nicht, aber . . .
 ‘I don’t know, but . . .’
 (57) a. jedes Mädchen hat jedes Feuerwehrbuch gelesen.
 every girl (A) has every fire.truck.book (B) read
 ‘every girl read every fire truck book.’
 b. #jedes Feuerwehrbuch hat jedes Mädchen _{t_{OBJ}} gelesen.
 every fire.truck.book (B) has every girl (A) _{t_{OBJ}} read
 ‘every girl read every fire truck book.’
 (58) a. mindestens ein Mädchen hat jedes Feuerwehrbuch gelesen.
 at.least one girl (A) has every fire.truck.book (B) read
 ‘at least one girl read every fire truck book.’ A»E
 b. jedes Feuerwehrbuch hat mindestens ein Mädchen _{t_{OBJ}} gelesen.
 every fire.truck.book (B) has at.least one girl (A) _{t_{OBJ}} read
 ‘at least one girl read every fire truck book.’ A»E

Note that it is this latter contrast, between (57b) and (58b), that provides the strongest evidence that we are dealing with Scope Economy as a condition distinct from ScoT. Although we attribute the deviance of (55b) to Scope Economy, that example could in principle also be accounted for just with ScoT, or a similar constraint. For example, if one assumed that ScoT only enforced PF reflection of the hierarchical relation among scope-bearing elements (and ignored all others), then ScoT (LF) would be irrelevant in (55), as it contains only one quantified NP. Only ScoT (IS) would come into play, and it would yield the right result in that example.³⁸ However, this alternative would not serve to draw the distinction between (57b) and (58b); in both cases, two quantifiers are involved, and the LF representations $A \gg B$ and $B \gg A$ are thus structurally distinct. Evidently, what matters is something more subtle, namely, the (non)commutativity of the quantifiers. By incorporating Scope Economy into our framework, we make precisely the right cut here: in (57b), movement of a universal across another universal fails to derive a distinct interpretation and is thus blocked. The derivation is thus excluded from the ScoT competition, but only, and interestingly contra Fox 2000, if Scope Economy constrains overt movement of the relevant kind, as well as covert movement.

In sum, we contend that it is clear that the Scope Economy facts do not challenge the basic architecture we propose, so long as Scope Economy can be construed as a derivational economy constraint, precisely as Fox (2000) argues. In this section, we have, rather more tenuously, suggested that incorporating Scope Economy into our model in this way does yield a prediction that other approaches do not make, and we have suggested that the initial evidence seems to bear this prediction out.

5.2 *The PF Interface: Focus Projection*

We now turn to Reinhart's (2005) other argument in favor of a PF-first approach, in which she more explicitly argues that a sentence's PF (including truly phonological properties such as sentential/phrasal stress) must be generated prior to the choice among possible LFs. Her discussion of the PF interface revolves around the phenomenon of "focus projection" in English. Reinhart proposes that (semantic) focus (at LF) is determined from the PF representation, via an economy condition that selects an optimal LF from among a reference set of competing LFs, matched to a single PF. We argue that the specific phenomena she considers find an equivalent (and arguably simpler) account in a model in which PF is projected from LF, and thus there is no compelling argument here against our general approach.

There is a rich literature on the relationship between prosodic prominence and (semantic) focus. On our reading of this literature, proposals originating with Chomsky (1971) and Jackendoff

³⁸ It seems to us that Williams (2003) might endorse the spirit of such a tack, although Williams explicitly collapses quantificational structure and topic structure, so that quantified and definite DPs are, in fact, part of the same representation, precluding the alternative sketched in the text.

(1972), continuing through the work of Selkirk (1984, 1996) and others, present algorithms that differ in detail but share with Reinhart's approach the view that prosody determines or constrains possible semantic focus interpretations. Here, we argue that the same facts may be captured by running the system the other way, by allowing focus interpretation to determine the placement of prosodic prominence—an argument consistent with our general architecture in which LF (including LF_{IS}) precedes PF.³⁹

The empirical core of Reinhart's proposal, building on ideas in Szendrői 2001, is the well-known contrast in focus projection (Höhle 1982): when stress falls on (the head noun of) the direct object, then any major constituent containing the direct object may be in focus, up to and including the sentence as a whole. Continuing to use question-answer pairs (as above) as a diagnostic for focus, we note that (59a) may answer any of the questions in (59b–d), illustrating DP-focus, VP-focus, and IP-focus (all-focus), respectively. Focus thus appears to project upward from the most prominent constituent.

- (59) a. My neighbor is building a DESK.
 b. What's your neighbor building? [FOC a DESK]
 c. What's your neighbor doing? [FOC building a DESK]
 d. What's this noise? [FOC my neighbor is building a DESK]

However, stress on the subject fails to license focus projection to IP; (60a) is felicitous as an instance of subject focus, but not in an all-focus context as in (60c).⁴⁰

- (60) a. My NEIGHBOR is building a desk.
 b. Who is building a desk? [FOC my NEIGHBOR]
 c. What's this noise? #[FOC my NEIGHBOR is building a desk]

Reinhart argues that this subject-object asymmetry is a special case of an economy condition regulating the possible (semantic) focus for a given intonational prominence. Following a long

³⁹ Our view is thus closer to that of Zubizarreta (1998). Although she states, for example, that "the F[ocus]-structure of [a] sentence is constrained by the location of main prominence" (p. 21), rules that she gives work by proceeding from a known focus structure and assigning prosodic prominence on the basis of that focus (see, e.g., her Focus Prominence Rule (p. 21), to which our implementation of (63) corresponds). Note that our aims in this section are modest: we wish only to show that our account is extensionally equivalent to Reinhart's (and perhaps simpler) and thereby to defuse her argument for a PF-first approach. We do not offer anything new to the extensive debate about the phenomena; and by demonstrating an empirical equivalence to Reinhart's account, we leave our account open to any empirical problems that hers faces. See Arregi 2002 and Wagner 2005 for discussion.

⁴⁰ Focus projection within the subject is possible, as Reinhart (2005:157) notes: (i) may be used in response to questions such as (ii) and (iii). As an answer to (iii), (i) represents focus projection; but the projection is limited to the subject DP, and (i) cannot be used to indicate IP focus.

- (i) [The man with the HAT] committed the murder.
 (ii) Did the man with the apron commit the murder?
 (iii) Who committed the murder?

tradition, she argues that (59a) is derived by the default stress rules of English—namely, some version of a Nuclear Stress Rule (NSR) assigning metrical prominence to the most deeply embedded constituent—and that (60a) involves an operation of Main Stress Shift, which assigns stress to the subject, overwriting the previously assigned metrical structure. The intuition at the core of Reinhart’s account is that stress shift is special—a costly operation that is licensed only if needed to signal a focus that is not generated by the NSR and focus projection. The IP is not a part of the focus set of (60a) (i.e., focus does not project to IP) because IP is a part of the focus set of (59a), which is the corresponding sentence but in which Main Stress Shift has not applied. Reinhart’s is explicitly an economy argument: the absence of focus projection to IP in (60a) is a direct consequence of the existence of a more economical alternative for representing that focus, namely, (59a). Stress shift is possible when the subject is in focus, since the subject does not contain the target of the NSR, and thus the subject DP is not in the focus set of the unshifted sentences. (For the same reason, limited focus projection within the subject DP is permitted, as seen in footnote 40.)

Under Reinhart’s proposal, the first (relevant) step of any derivation is application of the NSR and calculation of main stress. We give her formalism here for concreteness:⁴¹

(61) a. *Generalized (Nuclear) Stress Rule*

Assign a Strong label to the node that is syntactically more embedded at every level of the metrical tree.⁴² Assign Weak to its sister node.

(Reinhart 2005:133)

b. *Main (primary) stress*

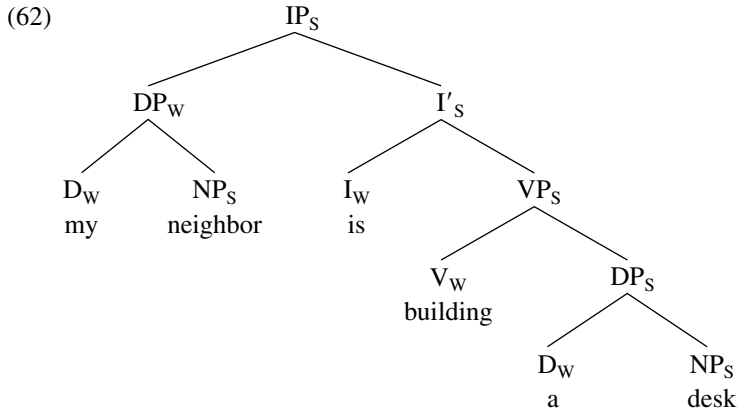
Main stress falls on the terminal node that is connected to the root node by a path that does not contain any Weak nodes.

(Reinhart 2005:132)

For the sentence *My neighbor is building a desk* in both (59) and (60), the first phase of the derivation will yield (62). In any such representation, there will be exactly one terminal node dominated by an unbroken sequence of strong (S) nodes; this is the bearer of main stress (*desk* in (62)).

⁴¹ Reinhart’s (2005) account is cast in the framework of Szendrői (2001), including the metrical tree notation of Liberman (1979). In this framework, nodes are marked either S (strong) or W (weak). As a simplification, these prosodic contours are represented directly on syntactic trees. The S-W marks are only relative, having no absolute value: given two sister terminal nodes, one S and one W, the S is relatively more prominent than the W node. All nodes in the tree (including nonterminals) bear S or W labels, but the primary function of the marking on nonterminals is to regulate the distribution of the levels of stress (primary, secondary, etc.) ultimately realized on the terminals of the tree (see below). Note that it is assumed that there is some principle (such as a version of the Obligatory Contour Principle) requiring that the sister of an S node be W (although sister W nodes are tolerated).

⁴² One may quibble about the notion of embedding used here, though this is beside the point. What is relevant is that a complement is generally more prominent than the head selecting it, while a specifier is less prominent than its sister (X’). See the literature cited for refinements, further discussion, and known problems with the NSR.



From this representation, the “focus set” (or reference set) is determined. This is the set of all S nodes connected to the root by an unbroken sequence of S nodes. In (62), the focus set includes {DP_{desk}, VP, and IP} but not the subject. The focus set constitutes the set of admissible semantic foci, given the locus of main stress. The next step of the derivation is to determine whether “the focus needed for the context” is or is not in the focus set (p. 155). If the intended focus is not in the focus set, then the rule of Main Stress Shift (63) applies, assigning a new main stress and overwriting (parts of) the original stress contour as needed.

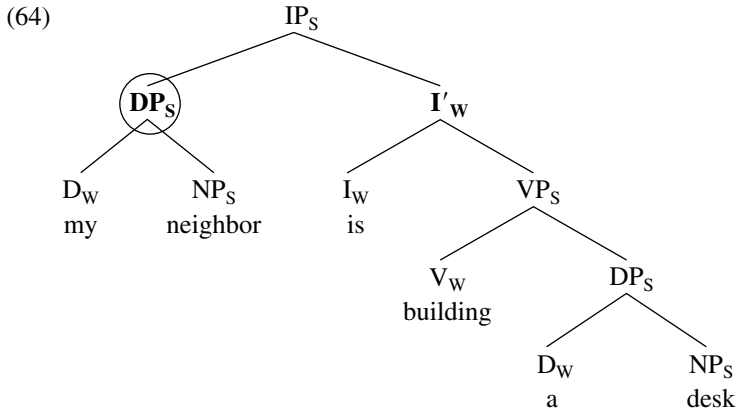
(63) *Main Stress Shift*

- a. Assign S to a node α [the semantic focus] and every node dominating α .
- b. Change the S sister of any node targeted by (a) to W.

(Reinhart 2005:151)

For example, if the intended focus is the subject (which is not in the focus set of (62)), Main Stress Shift applies, as illustrated in (64), where the shift rule marks the circled node S (and accordingly changes its sister from S to W). In the resulting representation, *neighbor* now bears main stress, and *desk* bears a secondary stress (if anything).⁴³ Focus projection from the subject to IP is blocked, accounting for the subject-object asymmetry in focus projection, since Main Stress Shift applies only if the intended focus is not contained in the focus set projected from the output of the NSR. IP is in the focus set of (62). Hence, it is only semantic focus on the subject that licenses stress on the subject.

⁴³ Note that not all rules overwrite previous information in this manner; we are not considering here an additional rule that Reinhart makes use of, Anaphoric Destressing, which assigns a W to some nodes prior to the application of the NSR. These Ws are not overwritten by the NSR, even where the NSR would otherwise assign an S. Reinhart’s system must therefore also stipulate which rules are information-preserving and which are information-changing. In our alternative (even when expanded to include Anaphoric Destressing), all rules are information-preserving.



Although this is cast as a PF-first calculation, in which the PF (locus of main stress) determines the possible semantic focus (and licenses marked operations), note that for the system to work, the intended (i.e., actual) focus must be known in advance of the application of the stress shift rule. In other words, the final PF representation is not fixed until the semantic focus is independently established. In our view, this aspect of the proposal undermines the argument for starting with the PF representation. In fact, the real work in Reinhart's system is being done by selecting an actual focus first and then determining which PF will spell out that focus: the PF derived by the NSR alone or the one derived with Main Stress Shift. In other words, we contend that the machinery Reinhart posits by starting from the PF representation in fact serves to mask a simpler LF-to-PF account, consistent with the view we have espoused throughout. Indeed, once this is recognized, there is also (in our view) no compelling argument for an economy computation in this domain.

Precisely the same effects that Reinhart's account describes are arrived at by applying the rules in the opposite order. Once the semantic focus is known (as it must be on Reinhart's account), the Main Stress "Shift" rule (63) applies first, assigning main stress to the constituent that bears semantic focus.⁴⁴ The NSR in (61a) subsequently applies as a default feature-filling operation, assigning S/W only to nodes that have not been assigned S/W values by Main Stress "Shift." As the reader may verify, applying the rules in this order is empirically indistinguishable from the outcome of Reinhart's algorithm.⁴⁵ Specifically, for any node dominating the direct object, including the absence of a focus (or IP-focus), the combination of Main Stress "Shift" and Default Stress (the NSR) will yield the representation in (62). Only subject focus (not IP-focus) will yield (64).⁴⁶

⁴⁴ Applying first to an unmarked representation, "shift" is thus a misnomer. Compare the Focus Prominence Rule in Zubizarreta 1998:21.

⁴⁵ The exact equivalence holds even when supplemented with additional rules in Reinhart's system, such as Anaphoric Destressing.

⁴⁶ Following Szendrői (2001), Reinhart (2005:136–137) considers, but objects to, a related approach that posits a [+focus] feature in the syntax. As Reinhart notes, this is a coding trick, used to make a property of the LF representation (semantic focus) visible to PF. This trick was necessary under the Y-model since spell-out occurs at a point in the derivation prior to (the calculation of) LF. The objection is moot under our model, and no syntactic focus feature is needed, since we are arguing that the PF of a sentence is derived from its LF, and thus any information in the latter is visible to the mapping to PF.

Note that in our LF-first view there is no focus set, no focus projection, no stress shift, no evaluation of competitors, no backtracking in the derivation, and no overwriting of previously assigned structure/labels. The effect of focus projection arises because distinct derivations with distinct foci may converge on identical PF representations. Such convergence occurs when the constituent in focus (marked S by (63)) is one that would be marked S by the default rule in any event. For example, if the object DP is in focus, then (63) assigns S to DP, VP, I', and IP in (62); in an IP-focus (all-focus) context, only the topmost node receives S from (63), while DP, VP, and I' are marked prominent by the default NSR. The outputs of the two derivations are indistinguishable. There is no meaningful notion of competition internal to the grammar of semantic-prosody mapping of focus, from our perspective. The derivation from LF (focus) to PF is deterministic; it just happens that the semantics has more distinctions available to it than the phonology does. Focus is (or may be) a property of nonterminals, and primary stress is typically manifested on a single terminal node. Since the terminals constitute a proper subset of the nodes that may (semantically) be in focus, it follows that there will necessarily be neutralization of meaningful semantic distinctions in the PF representation. Apparent ambiguity thus arises, but as a matter of empirical observation, where the system is run backward, as it were: the hearer/observer starts from the PF, but the grammar starts from the LF. A "focus set" for a given prosodic contour is a convenient description of the set of LFs that give rise to the same prosodic contour, but the focus set is epiphenomenal, a descriptive artifact and not a part of the grammar.⁴⁷

We conclude, therefore, that the facts of focus projection and the connection between focus and stress in English provide no argument in favor of a system in which LF is projected from

⁴⁷ Later in her book, Reinhart appears to concede an argument such as the one we have just sketched, stating that "[t]he empirical evidence that [reference set computation] is needed is not huge. In most instances, an alternative simpler theory would capture the facts just the same" (2005:246). Even so, she makes two arguments that the reference set theory she proposes is superior to deterministic alternatives (such as ours). One argument is made somewhat implicitly in passing, and the other is an explicit argument from acquisition.

The first argument we may dispense with straightforwardly. Reinhart repeatedly refers to the "shifted" stress as "marked" and appears to imply that speakers perceive a difference between "marked" and "neutral" stress contours. She appears to take this as *prima facie* evidence for setting up a special operation (Main Stress Shift) that yields (all and only) the marked outputs. On our view, Main Stress "Shift" (63a) derives both shifted and (some) nonshifted interpretations, as detailed above, so there is no single operation that draws this distinction. But this does not decide the issue in any way that we can see. What is at stake in speakers' intuitions here is the ability to take a given stress contour and to evaluate whether it is the same as, or different from, the contour that would be generated if there were no constituent (other than IP itself) in focus. Under both systems (ours and Reinhart's) this computation is well-defined and can be taken to underlie the feeling of "markedness" associated with some contours (in fact, precisely the same class of contours on both approaches).

Reinhart's more interesting argument comes from acquisition evidence (see 2005:238–272). Reinhart herself acknowledges the incompleteness of the evidence, but we may grant all data points and assumptions for the purposes of the argument. The upshot of (her interpretation of) the evidence is this: Children can be shown experimentally to be sensitive to stress and to be able to use stress information in various types of disambiguation tasks. Nevertheless, when children are presented with examples involving stress shift, where they are required to demonstrate an awareness of the focus associated with this shift, they behave in a manner interpreted as guessing. In Reinhart's view, this selective inability to comprehend the focus associated with stress shift constitutes evidence for a special processing cost associated with reference set computation. However, the same results (if indeed this is what the experimental evidence shows) are straightforwardly consistent with the view presented here. We need only assume that children do not have full mastery (at the relevant age) of the adult rule relating stress to semantic focus in (63a).

PF, and in particular, no hurdle to our view that information flows in the opposite direction. Combining this with the discussion of Scope Economy, we find that Reinhart's Interface Economy model, although cast as a proposal that takes PF (surface) representations as the input to economy calculations, provides no compelling evidence for that architectural decision, and that all the evidence she gives is equally consistent with an account like the one we have argued for here in which LF (including LF_{IS}) is the input to competitions that select the best corresponding PF.

6 Summary and Outlook

In this article, we have argued for the following points:

1. There exist "soft" constraints (economy conditions) that value a particular type of correspondence between LF and PF representations (e.g., scope at LF matched by precedence at PF).
2. These constraints are unidirectional: LF (broadly construed) is calculated first and determines PF (surface word order).
3. Scope rigidity (the apparent absence of QR) is a property not of languages but of specific configurations, and the distribution of rigidity effects is (largely) predictable from independent variation in the syntactic resources of various languages (e.g., possibilities for scrambling). There is no $\pm$ QR parameter.

We have focused in particular on the interplay between points 1 and 2. We have argued that there is a (possibly universal) constraint favoring transparent reflection of LF properties (scope, information structure) in PF precedence relationships, but that this constraint may be overridden when it is at odds with other economy conditions. The telltale sign of this constraint interaction, we submit, lies in what we have called the $\frac{3}{4}$ signature effect. That is, when two conditions conflict, derivations may satisfy either of them, and a particular type of optionality emerges. However, when conditions align, they must be satisfied. An observation that we take to be of architectural import is that, for the range of constructions surveyed, the effects are properly characterized only if different PF representations (word orders, in the general case) compete for the realization of a fixed LF, and not the other way around. This model conflicts with common proposals that inherit (sometimes tacitly) the GB ordering of covert operations after "Spell-Out." By giving up that commitment, we believe we offer a fresh, and possibly simpler, perspective on these interactions. We have examined in some detail one particular instantiation of the competing proposal (Reinhart's (2005) Interface Economy) and argued that none of the facts presented to support it compel a grammatical model in which a single PF determines possible LFs, as opposed to our view.

In an attempt to flesh out the common intuition that freedom of word order is correlated in some manner with scope rigidity, we have proposed a means to derive crosslinguistic and language-internal differences in the distribution of covert scope-shifting operations (QR) from the independently attested differences in the freedom of word order variation (scrambling). At the same time, we have left open the characterization of this more fundamental point of variation:

the nature of the scrambling operation. Although our approach has been programmatic in some respects, and although it will take a good deal of further work to see just how far one can make good on the promise of our approach, we suggest that we have offered some incremental progress toward a theory of the interaction of word order and scope.

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