1 Introduction

This paper discusses a certain group of focus, which are sometimes claimed to have no phonetic realization. We will see below that these apparently ‘inaudible’ foci are in fact phonetically marked (as already claimed by many researchers), although they are realized in a more subtle way than other ordinary foci. The aim of this paper is to characterize such ‘apparently inaudible’ foci in a more appropriate way, and provide an account which explains why they are realized differently from the other focus expressions.

I will demonstrate that these foci are apparently inaudible because it is embedded inside a phonetic realization of other focus. Although they are still audible, in the sense that they are phonetically marked, their realizations are ‘embedded’ inside the realization...
of the other focus in the same sentence. In this paper, therefore, we will call them *Embedded Foci* (EF).

We will first discuss two cases of embedded foci (§2). First case is the so-called *second occurrence focus* (henceforth *SOF*). This phenomenon has been already extensively discussed in the literature (Partee, 1991; Rooth, 1992, 1996; Krifka, 2004; Bartels, 2004; Beaver et al., 2004). We will review Féry and Ishihara’s (2005) discussion on the case where SOF is clearly marked by pitch accent. As another instance of EF, we will discuss a certain case of Japanese indirect *wh*-question. Although indirect *wh*-questions are usually phonetically marked by a focus intonation (*FI*), such FI realization is apparently absent in a certain condition. *wh*-question. There are commonalities in these two cases. First, the ‘apparently inaudible’ foci are in both cases phonetically marked, although differently from the ordinary ones. Second, these foci can be realized just like ordinary foci depending on their location in the sentence.

We will review the Multiple-Spell Out (*MSO*) analysis in Ishihara (2003, 2004, 2005), which is proposed for the intonation of *wh*-questions in Japanese, and then try to apply to German SOF sentences (§3). There is, however, a problem that MSO model encounters when we apply it to second occurrence focus phenomenon in German. I will attempt to solve this problem by adopting the idea of ‘primary focus’ by Büring (2005).

This modification seems to have a further preferable consequence, as it can solve a certain paradoxical situation in terms of the FI realization of a certain case of *wh*-question, where the experimental results do not correspond to speakers’ intuition reported in the literature. We will discuss how this paradox can be explained under the modified MSO analysis (§4).

## 2 ‘Apparently Inaudible’ Foci

Focus is usually phonetically realized, e.g., by pitch accent. There are, however, cases where focus is apparently not phonetically marked. In this section, we will survey two such cases. One is second occurrence focus (SOF) in English and German, and the other is indirect *wh*-question contained in a matrix *wh*-question in Japanese. In both cases, ‘apparently inaudible’ foci are in fact phonetically marked, although the realization is much more subtle. It will be also shown that these foci can be marked normally, just like other ordinary foci, when they are located differently in the sentence with regard to the other focus in the sentence. Based on the facts we review in this section, we will characterize these ‘apparently inaudible’ foci as embedded foci.

### 2.1 Second Occurrence Focus (SOF)

One famous and well-discussed case of ‘apparently inaudible’ focus is the so-called *Second Occurrence Focus* (SOF), as in (1):

(1) a. Everyone already knew that Mary only eats [vegetables]$_F$.

   b. If even [Paul]$_F$ knew that Mary only eats [vegetables]$_{SOF}$, then he should have suggested a different restaurant. (Partee, 1999, 215–216)
In (1b), *vegetables* is supposed to be focused, because it is associated with a focus-sensitive adverb *only*. This phrase, however, does not bear a pitch accent, contained in a deaccented material following the other focused phrase in the sentence, *Paul*. This ‘apparently inaudible’ focus triggered discussion on the semantic theory of focus (Partee, 1991; Rooth, 1992, 1999; Krifka, 2004, among others).

### 2.1.1 Phonetic Realization of SOF

Some researchers examined the phonetics of SOF (Rooth, 1996; Bartels, 2004; Beaver et al., 2004; Féry and Ishihara, 2005) and claimed that SOFi are in fact phonetically marked, though not like a first occurrence focus (FOF). Beaver et al. (2004) made an extensive phonetic examination of SOF sentences. They compare various phonetic cues (duration, \(F_0\), intensity) of the two postverbal phrases in the last sentences of (2) and (3):

\[
\begin{align*}
(2) & \quad a. \text{ Both Sid and his accomplices should have been named in this morning’s court session.} \\
& \quad b. \text{ But the defendant only named Sid in court today.} \\
& \quad c. \text{ Even the state prosecutor only named Sid in court today.} \\
(3) & \quad a. \text{ Defense and Prosecution had agreed to implicate Sid both in court and on television.} \\
& \quad b. \text{ Still, the defense attorney only named Sid in court today.} \\
& \quad c. \text{ Even the state prosecutor only named Sid in court today.}
\end{align*}
\]

(Beaver et al., 2004, ex. (11), (12))

The (c) examples contain a SOF in both cases. In (2), the DP *Sid* is a SOF and the PP *in court* is a non-focus, while in (3) *Sid* is a non-focus and *in court* is a SOF. They reported that SOF expressions are significantly longer than non-focused counterparts (on average 6ms longer). The various \(F_0\) measures (range, minimum), on the other hand, are marginal. This contrasts sharply with the ordinary focus, which is usually marked clearly by a pitch accent. Their results shows two things: (i) SOF is phonetically marked; and (ii) its realization is different from that of ordinary (first occurrence) focus.

### 2.1.2 Prenuclear and Postnuclear SOF

Féry and Ishihara (2005) discuss SOF in German. They have shown that SOFi are phonetically marked by duration, confirming the claims made by other researchers for English (Rooth, 1996; Bartels, 2004; Beaver et al., 2004). In addition, they show that SOFi are also realized with a clear pitch accent when it is located on the left of the FOF. All the SOF sentences examined in the previous literature always have SOF expressions after FOF phrases (cf. (2), (3)). Féry and Ishihara (2005) examined not only the sentences that have SOF expressions following FOF, but also those that have SOF expressions preceding FOF, as in (4):

\[
(4) \quad \text{(Die meisten unserer Kollegen waren beim Betriebsausflug lässig angezogen.)} \\
\text{‘Most of our colleagues were dressed casually at the staff outing.’}
\]
a. **FOF**
Nur Peter<sub>FOF</sub> hat eine Krawatte getragen.
‘Only Peter wore a tie.’

b. **SOF: Prenuclear**
Nur Peter<sub>SOF</sub> hat sogar einen Anzug<sub>FOF</sub> getragen.
‘Only Peter even wore a suit.’

c. **SOF: Postnuclear**
Sogar einen Anzug<sub>FOF</sub> hat nur Peter<sub>SOF</sub> getragen.

(5) (Wen hat Peter geküsst?) ‘Who did Peter kiss?’

a. **Non-Focus: Prenuclear**
Peter<sub>NOF</sub> hat Maria<sub>F</sub> geküsst. ‘Peter kissed Maria.’

b. **Non-Focus: Postnuclear**
Maria<sub>F</sub> hat Peter<sub>NOF</sub> geküsst.

They used two different word order for SOF sentence, taking advantage of the V2 property of German. In (4b), the SOF expression Peter is in the sentence initial position, preceding the FOF Anzug ‘suit’. In (4c), Peter is in the sentence medial position, following the FOF Anzug. The SOF expressions are also compared with Non-Focus counterparts in (5a) and (5b), which precedes and follows the focused expression Maria, respectively.

First, their results in duration are summarized below.¹

(6) **Result for Duration**

(Féry and Ishihara, 2005, Fig. 2)

The results show that focused element (FOF/SOF) are generally longer than the non-focus counterparts. The contrast between FOF and SOF are not significant. Since SOF

¹They used a regression analysis to factor out the syllable length of the target words. The results shown in (i) is a mean residual duration. A higher positive value means longer duration, while negative value means shorter duration.
also shows a longer duration regardless of its location (sentence-initial or medial), it can be said that duration is always a clear indicator for focus. These results are compatible with what Beaver et al. (2004) and others (Rooth, 1996; Bartels, 2004) have found in their experimental results.

Next, the results in pitch are summarized below:

\[(7) \quad \text{Result for } F_0\]

\[
\begin{array}{c|c|c|c}
\hline
\text{Condition} & \text{SOF} & \text{NonF} \\
\hline
\text{Sentence-initial} & \text{high } F_0 & \text{low } F_0 \\
\text{Sentence-medial} & \text{low } F_0 & \text{low } F_0 \\
\hline
\end{array}
\]

(Féry and Ishihara, 2005, Fig. 2)

In the sentence-initial condition (dark bars), SOF bears a higher $F_0$ than its non-focus counterpart. In the sentence-medial position (light bar), there is no significant difference between SOF and non-focus. Assuming that the FOF expressions bears the nuclear pitch accent, their results show SOF is realized with a pitch accent in a prenuclear position, but not in the postnuclear position. We can summarize the characteristics of SOF as follows.

\[(8) \quad \begin{align*}
\text{a. } & \text{SOF is always marked by longer duration.} \\
\text{b. } & \text{SOF lacks pitch realization when it follows a nuclear pitch accent on the FOF.} \\
\text{c. } & \text{SOF shows pitch realization when it precedes a nuclear pitch accent on the FOF.}
\end{align*}\]

### 2.2 Indirect Wh-question in Japanese

Another case of 'inaudible' focus can be observed in Japanese wh-questions. It has been shown that wh-questions in Japanese usually exhibits a focus intonation (henceforth, FI) (Maekawa, 1991a,b; Deguchi and Kitagawa, 2002; Ishihara, 2002, among others). The $F_0$-peak of the wh-phrase is boosted, followed by $F_0$-compression of the subsequent material until the end of the clause headed by the question particle. The following is examples of declarative sentence, matrix wh-question, indirect wh-question, respectively.

\[(9) \quad \begin{align*}
\text{a. Declarative sentence} & \quad \text{Naoya-wa [Mari-ga} \text{ nanika-o} \text{ nomiya-de nonda to]} \text{ imademo} \\
\text{Naoya-TOP} & \text{Mari-NOM something-ACC bar-LOC drank that even.now} \\
& \text{omotteru} \text{ think}
\end{align*}\]
‘Naoya still thinks that Mari drank something at the bar.’

\[ \text{Naoya-wa Mari-ga nani-o nomiya-de nonda to imademo omotteru no?} \]

‘What did Naoya still think that Mari drank t_i at the bar?’

\[ \text{Naoya-wa Mari-ga nani-o nomiya-de nonda ka imademo omotteru no} \]

‘Naoya still remembers what t_i Mari drank t_i at the bar.’

In (9a), each word in the sentence shows a pitch accent. In (9b), where the wh-phrase takes the matrix clause as its scope domain, the F0-peak of the wh-phrase nani-o ‘what-ACC’ is boosted (indicated by an upright arrow). In addition, all the pitch contour

\[ \text{In this example, all the words are lexically accented. For focus realization on lexically unaccented words, see Pierrehumbert and Beckman (1988).} \]
following the wh-phrase is compressed until the end of the sentence (indicated by shading). In (9c), where the wh-scope is limited to the embedded clause, post-focal F₀-compression is observed only within the embedded clause. The pitch range is reset to the original height (just as high as in (9a)) after the embedded clause. This focus intonation–wh-scope correspondence is discussed in detail in Deguchi and Kitaga wa (2002); Ishihara (2003), among others. In general, wh-phrases are always marked by F₀-boosting, followed by the F₀-pitch compression.

2.2.1 Indirect wh-question contained in a matrix wh-question

There is, however, a case in which such a typical focus F₀-boosting cannot be observed on a wh-phrase. The following example is from Kitagawa (To appear).

(10) Amy-wa [dare-ga asokode nani-o katta ka] sonnani siritagatteiru no?

A.-TOP who-NOM there what-ACC bought Q that.much want.to.know Q
‘Who is such that Amy wants to know so eagerly [ what he₁ bought there ]?’
(Kitagawa, To appear, ex. (7))

In this sentence, the first wh-phrase dare ‘who’ is interpreted as a matrix wh-question. This phrase exhibits an F₀-boosting, and induce a post-focal F₀-compression until the end of the sentence. The second wh-phrase nani ‘what’, on the other hand, does not show a clear F₀-boosting. Based on this observation, Kitagawa (To appear) claims that the second wh-phrase is not focused.

A similar case is experimentally examined in Ishihara (2003), using sentences like (11):

(11) dare-ga [Mari-ga nani-o nomiya-de nonda ka] imademo obòeteru no?

who-NOM Mari-NOM what-ACC bar-LOC drank Q even.now remember Q
‘Who still remembers what t₁ Mari drank t₁ at the bar?’
(Ishihara, 2004, 100)

The (10) and (11) are syntactically different in that the first wh-phrase is in the embedded clause in (10), while it is in the matrix clause in (11). They, however, have the same condition in that the linearly first wh-phrase takes a matrix scope while the second one takes an embedded scope. Ishihara (2003) claimed that the wh-phrase in the embedded clause is in fact shows an FI, although its realization is strongly compressed due to the other FI that appears in the matrix clause. The stimuli in Ishihara’s (2003) experiment are schematically shown below.

(12) Stimulus set (with predicted F₀-boosting and compression)

a. Indirect Yes/No-question (−WH/−WH)


b. Indirect Wh-question (−WH/+WH)

c. *Matrix Wh-Q with indirect Y/N-Q* (+WH/−WH)

\[
[ \text{P1}_{\text{+WH}} \ldots \text{P2}_{\text{−WH}} \ldots \text{P3} \ldots \text{P4}_{\text{+Q}} \ ] \text{P5} \ldots \text{C}_{\text{+Q}}
\]

d. *Matrix Wh-Q with indirect Wh-Q* (+WH/+WH)

\[
[ \text{P1}_{\text{+WH}} \ldots \text{P2}_{\text{+WH}} \ldots \text{P3} \ldots \text{P4}_{\text{+Q}} \ ] \text{P5} \ldots \text{C}_{\text{+Q}}
\]

(12a) and (12b) are an indirect Yes/No-question and an indirect wh-question, respectively. We have seen above (§2.2) that indirect wh-question exhibits an FI within the embedded clause, F0-boosting on the wh-phrase and F0-compression until the end of the embedded clause. The assumption here is that only wh-questions, but not Yes/No-questions exhibits an FI in the embedded clause (cf. Maekawa, 1991b). With this assumption, we expect that the wh-phrase (P3) in the indirect wh-question in (12b) becomes higher than its counterpart full DP in (12a) due to the focus F0-boosting, and that the following F0-peaks (P4, P5) within the embedded clause in (12b) become lower than those of (12a), due to the post-focal F0-compression. We also expect a pitch reset after the embedded clause: The F0-peak of the matrix material after the embedded clause (P5) becomes the same in (12a) and (12b).

In (12c) and (12d), the matrix sentence is a wh-question. (12c) is a matrix wh-question containing an Yes/No-question. This sentence is expected to show an FI for the matrix wh-question, but not for the Yes/No-question in the embedded clause. Compared with this sentence is (12d), which is a matrix wh-question containing an indirect wh-question. The main purpose of the experiment is to see whether the embedded wh-question shows an FI in this sentence. If the embedded wh-phrase in (12d) is phonetically marked as a focus, then the pitch contours of (12c) and (12d) should exhibit the same contrasts within the embedded clause as those between (12a) and (12b), although the realization is compressed (due to the post-focal compression from the matrix wh-question). If no focus realization is found for the embedded wh-phrase, then (12c) and (12d) would look the same. Below is one of the stimulus sets in the experiment.

(13)  

a. *Indirect Yes/No-question* (−WH/−WH)

Náoya wa [Mári-ga nánika-o nomiya-de nónda ka] ímademo obôeteru
N.-TOP M.-NOM something-ACC bar-LOC drank Q even.now remember
‘Naoya still remembers whether Mari drank something at the bar.’

b. *Indirect wh-question* (−WH/+WH)

Náoya wa [Mári-ga nání-o nomiya-de nónda ka] ímademo obôeteru
N.-TOP M.-NOM what-ACC bar-LOC drank Q even.now remember
‘Naoya still remembers what Mari drank at the bar.’

c. *Wh-question with an indirect Yes/No-question* (+WH/−WH)

dáre-ga [Mári-ga nánika-o nomiya-de nónda ka] ímademo obôeteru no?
who-NOM Mari-NOM smthg-ACC bar-LOC drank Q even.now remember Q
‘Who still remembers whether Mari drank something at the bar?’

d. *Wh-question with an indirect wh-question* (+WH/+WH)

Náoya wa [Mári-ga nání-o nomiya-de nónda ka] ímademo obôeteru no?
who-NOM M.-NOM what-ACC bar-LOC drank Q even.now remember Q
‘Who still remembers what Mari drank at the bar?’
The results in Ishihara (2003) were not straightforwardly clear, as only some speakers (two out of four) showed phonetic realization of focus on the indirect wh-question. It is at least confirmed that some speaker do show an FI. Importantly, however, this realization is much smaller than the that of the matrix wh-question. This phenomenon is parallel to SOF in the sense that apparently inaudible focus is in fact phonetically marked, but in a much more compressed fashion. See Ishihara (2003, 2004) for more detailed discussion of the experiment.³

2.2.2 Preposed indirect wh-question

Although there is no experimental data, it is quite clear that the FI of the indirect wh-question is clearly realized when the embedded clause is scrambled and located in the beginning of the sentence, just like in the case of German prenuclear SOF.⁴ ⁵

(14) a. \[
\begin{array}{c}
\ldots \text{WH} \ldots \left[ \ldots \text{WH} \ldots Q \right] \ldots Q
\end{array}
\]

b. \[
\begin{array}{c}
\ldots \text{WH} \ldots Q \mid_i \ldots \text{WH} \ldots t_i \ldots Q
\end{array}
\]

(15) a. \((=\text{(11)})\)

\[
\begin{array}{c}
dare\text{-ga} \quad [\text{Mari-ga nani-o} \quad \text{nonda ka}] \quad \text{i\textquoteright mademo ob\text{"o}eteru no?}
\end{array}
\]

\[
\begin{array}{c}
\text{who-NOM M.-NOM what-ACC drank Q even.now remember Q}
\end{array}
\]
‘Who still remembers what i Mari drank t_i?’

b. *Embedded clause preposed*

\[
\begin{array}{c}
[Mari-ga nani-o \quad \text{nonda ka}]_i \quad \text{dare-ga} \quad t_i \quad \text{i\textquoteright mademo ob\text{"o}eteru no?}
\end{array}
\]

\[
\begin{array}{c}
\text{M.-NOM what-ACC drank Q who-NOM even.now remember Q}
\end{array}
\]
‘(Lit.) [What i Mari drank t_i]_i, who still remembers t_j?’

2.3 Embedded Focus (EF)

From the discussion so far, it is now clear that ‘apparently inaudible’ foci are in fact phonetically marked, although the realization is much more subtle. Furthermore, they become audible if they precedes the other focus in the sentence that bears the highest prominence of the sentence.

³This experiment is conducted again with better controlled stimuli and more subjects (Ishihara, In prep.). In this experiment, 6 subjects’ data showed the significant effect while 4 subjects’ data did not (2 subjects’ data were excluded).

⁴It is impossible to construct such a case with a sentence like (10), where both wh-phrases are in the embedded clause, because it is impossible to leave the first wh-phrase in-situ while the rest of the embedded clause is preposed.

⁵Also, it is impossible to move only the wh-phrase in front of the first wh-phrase, instead of moving the whole embedded clause, to induce the same effect. See §?? below for relevant discussion. See also Kurata (1991); Saito (1994) for earlier discussion.
Given that the term ‘inaudible’ foci is not appropriate for the type of foci discussed above, we might need a more appropriate one for the discussion below. From the discussions in the previous section, there are two important conditions for the ‘apparently inaudible’ foci. First, there is another focus that bears the highest prominence in the sentence: In the case of SOF, there is a FOF that bears the nuclear pitch accent; in the case of Japanese \(wh\)-question discussed above, there is a \(wh\)-phrase that takes a matrix clause as its \(wh\)-scope. The other factor is the location of the focus with respect to the other focus: The ‘apparently inaudible’ foci always follow the other matrix focus. As shown by Féry and Ishihara (2005), SOF may exhibit an unusual focus realization with a pitch accent if it precedes the FOF. In the same way, if the embedded clause is scrambled to the beginning of the sentence, the indirect \(wh\)-phrase in Japanese shows a \(F_0\)-boosting.

This means that the ‘apparently inaudible’ foci are within the domain of postnuclear deaccenting or post-focal compression induced by the other focus that have a larger FI domain. In other words, the phonetic realization of the ‘apparently inaudible’ focus is embedded inside the phonetic realization of the other focus that takes a larger scope. Therefore, we will call them Embedded Foci or EF from now.

3 Multiple Spell-Out Analysis

In Ishihara (2003), I proposed an analysis that accounts for the FI realization in various \(wh\)-questions. The basic idea is this: Prosody is computed cyclically during the course of derivation. Adopting the notion of phase and Multiple Spell-Out (MSO), I claimed that an FI is created when a focus and its operator (e.g., \(wh\)-phrase and question particle) is found in a Spell-Out domain. All the material that will be introduced to the derivation later than the Spell-Out will not be affected by the realization of this FI.

Syntactic component of the grammar builds a sentence from the bottom. At each phase (assumed to be \(vPs\) and \(CPs\)), where some syntactic Agreement relations are established, the material in the complement of the phase head (VP for \(vP\) phase, TP for \(CP\) phase) is sent to PF (Spell-Out). All the details aside, when a focused phrase and its operator establishes an Agreement relation at some phase \(P\), then an FI is created at its Spell-Out (\(SO\_P\)). If there is no focus-related Agreement relation is established at \(P\), then \(SO\_P\) is produced with a default pitch contour, presumably calculated according to the syntax-prosody mapping principle proposed by Selkirk and Tateishi (1991) and others. Let us take a look at how it works with some examples.

The first example is an indirect \(wh\)-question, schematically shown in (16).

\[
\text{Indirect } \text{wh-question} \\
[CP2 \ldots \{CP1 \ldots \text{WH} \ldots \text{Q} \} \ldots ]
\]

At the embedded CP phase (CP1)\(^6\), the question particle is introduced to the derivation and establishes an Agreement relation with the \(wh\)-phrase. Therefore, an FI will be created at the Spell-Out of this phase, before the matrix clause is built. The \(F_0\)-peak of the \(wh\)-phrase phrase is boosted, and the post-focal \(F_0\)-compression compresses the pitch contour until the end of the Spell-Out domain, i.e., the end of the embedded clause.\(^7\)

\(^6\)I omit \(vP\) phase, because no focus-related Agreement is established there.

\(^7\)Technically speaking, the question particle, presumably the head of the CP phase, is outside the
(17)  *Spell-Out of CP1 phase: FI created*

\[ \text{CP1} \ldots \text{WH} \ldots Q \]

All the material that is introduced to the derivation and sent to PF at later Spell-Out cycles will create a default pitch contour that is not affected by the FI created at the earlier cycle. As a result, the pitch range after the embedded clause will be reset to the non-compressed level. This is in fact what we saw in (9c) above.

(18)  *Spell-Out of CP2 phase: Pitch reset after CP1*

\[ \text{CP2} \ldots [\text{CP1} \ldots \text{WH} \ldots Q] \ldots \]

In the case of a matrix *wh*-question, the FI creation takes place at the matrix CP phase instead of the embedded CP phase.

(19)  *Matrix wh-question*

\[ \text{CP2} \ldots [\text{CP1} \ldots \text{WH} \ldots] \ldots Q \]

In this case, no FI is created at the embedded CP phase (CP1), because the *wh*-phrase has not established an Agreement relation with a question particle, which has not yet introduced to the derivation. In such a case, a default pitch contour is created.

(20)  *Spell-Out of CP1 phase: No FI created*

\[ \text{CP1} \ldots \text{WH} \ldots \]

At the matrix CP phase (CP2), where the question particle is introduced to the derivation and establishes an Agreement relation with the *wh*-phrase, an FI will be created at the Spell-Out. As a result, the F₀-peak of the *wh*-phrase is boosted, and the post-focal F₀-compression continues until the end of the Spell-Out domain, i.e., the end of the sentence. This is what we saw in (9b).

(21)  *Spell-Out of CP2 phase: FI created*

\[ \text{CP2} \ldots [\text{CP1} \ldots \text{WH} \ldots] \ldots Q \]

There are several advantages of this approach. First, under this analysis, the phonological process remains simple, while correctly deriving prosodic FI domains that correspond to the scopes of *wh*-question. We assume that at a Spell-Out at which an FI is created, the following FI rules apply to the derivation.

(22)  *FI Rules*

a.  *Focus F₀-boosting:* Boost the F₀ of any phrase with a FOC-feature in \( \phi \).

b.  *Post-focus F₀-reduction:* Compress the F₀ thereafter.

\[ \text{TP} \ldots \text{WH}_{\text{FOC}} \ldots \] \( \Rightarrow \) \( \phi \ldots \text{WH} \ldots \)

The rules are simple: Boost the F₀-peak of focus, and compress everything thereafter. Note that there is no special mechanism to specify the end point of the post-focal F₀-compression. Since FIs are created at relevant Spell-Out domains, the end point is automatically determined. This cyclic analysis can naturally derives the prosody-syntax

correspondence between FI domain and *wh*-scope.

Also, this model allows embedding of FIs. This property is the most relevant for the discussion here. When there are two WH-Q relations that take different scopes, the MSO model predicts that the two FIs are created at different Spell-Out cycles. Then it is possible that one FI is embedded inside another. This is exactly what happens in the case of (10) or (11) (repeated below) discussed above.

(11) **dare-ga** [Mari-ga **nani-o nomíya-de nónda ka**] ímademo obóeteru **no**?

> who-NOM Mari-NOM what-ACC bar-LOC drank Q even.now remember Q

‘Who still remembers what Mari drank at the bar?’

First, at the embedded CP phase, the FI for the indirect *wh*-question is created. This FI, however, will be embedded inside the F₀-compression domain of another FI, the FI for the matrix *wh*-question that is created at the matrix CP phase. As a consequence of these two FIs, the F₀-peak of the embedded *wh*-phrase is first boosted (at the embedded CP phase), and then compressed (at the matrix CP phase). This explains the fact that the embedded focus is phonetically marked, but in a very subtle and compressed manner.

### 3.1 Problem: German SOF

We have seen above that the MSO analysis nicely accounts for the EF in Japanese *wh*-question. It may be interesting to extend the analysis to the other EF phenomenon that we discussed so far, German SOF. We will see below, however, that such an attempt raises some problems.

In order to apply the MSO analysis to German SOF sentences, we need to make some assumptions. First, there are two analyses for the potential syntactic positions of focus-sensitive operators. One possibility is adjoining them to non-arguments (VPs/TPs/CPs); the other is adjoining them to argument DPs (cf. Büring and Hartmann, 2001, for discussion). The focus-sensitive adverb *sogar* in (23), for example, could be attached to either the VP or the object DP.

(23) Peter hat **sogar** eine Krawatte getragen.

> Peter has even a tie worn

> ‘Peter even wore a tie.’

a.  [CP Peter₁ hat [TP tᵢ [VP **sogar** [DP eine Krawatte] getragen ]]]

b.  [CP Peter₁ hat [TP tᵢ [VP **sogar** [DP eine Krawatte]] getragen ]]

In the same fashion, sentence-initial adverbs in (24) can be analyzed in two ways: adjoined to the CP, or to the subject DP.

(24) Nur Peter hat eine Krawatte getragen.

> only Peter has a tie worn

> ‘Only Peter wore a tie.’

a.  [CP **Nur** [CP [DP Peter₁] hat [TP tᵢ [VP [DP eine Krawatte] getragen ]]]]

b.  [CP [DP **Nur** [DP Peter₁]] hat [TP tᵢ [VP [DP eine Krawatte] getragen ]]]
In the discussion below, we will adopt the first option, namely the assumption that adverbs are adjoined to VP (or vPs), TPs, or CPs, following Büring and Hartmann (2001) for expository purpose. The following discussion, however, does not hinge on this assumption. Even if we adopt the other option, we will encounter the same problem.

Also, we need to state the focus intonation rules for German. Let us keep it simple, as follows:

(25) **FI Rules for German**
a. Place an nuclear pitch accent on a phrase bearing focus (and lengthen it).
b. Deaccent all the material within the Spell-Out domain after the nuclear pitch accent.

Now we are ready to apply the MSO analysis to German SOF sentences. We need to account for the intonation patterns for both the prenuclear and postnuclear SOF sentences, repeated below with pitch accents and deaccenting indicated. (Pitch accents are marked with **bold face** and an acute á, deaccenting with underline.) Recall that the prenuclear SOF in (26a) is realized with a pitch accent, while the postnuclear SOF in (26b) is deaccented.

(26) **German SOF sentences**
a. **SOF: Prenuclear**
   Nur **PÉter**SOF hat sogar einen **Ánzug**FOF getragen.
   ‘Only Peter even wore a suit.’

b. **SOF: Postnuclear**
   Sogar einen **Ánzug**FOF hat nur **Péter**SOF getragen.

We will first look at the postnuclear SOF case, (26b), whose structure is as follows:

(27) \[\mathbf{CP \ Sogar \ [\mathbf{[\mathbf{CP \ [\\textit{einen Anzug}}_\text{FOF}]}_i \ \mathbf{hat \ [\mathbf{TP \ nur \ [\mathbf{TP \ \text{PÉter}}_\text{SOF} \ [\mathbf{[\text{vP \ \textit{t}}_i \ \text{getragen}] outside}] outside}]]}]]\]

First, at the vP phase, its Spell-Out domain, VP \([\text{vP \ getragen}]\), is sent to PF. Since it contains no focus, no FI is created. At the next phrase, CP, the Spell-Out domain is TP, which contains a focus-sensitive operator **nur** ‘only’ and a focused phrase **Peter**. At this point, an FI is created.

(28) \[\mathbf{CP \ phrase: \ Spell-Out \ of \ TP} \]
\[\mathbf{[\mathbf{TP \ nur \ [\mathbf{TP \ \text{PÉter}}_\text{SOF} \ [\text{vP \ \textit{t}}_i \ \text{getragen}] outside}] outside}]]\]

There are some more material to be sent to PF. So we assume that there is another Spell-Out operation, which we call **Root Spell-Out**. At the root Spell-Out, the other focus-sensitive operator **sogar** and the focused phrase **einen Anzug** ‘a suit’ is sent to PF. Hence a new FI is created and superimposed to the derivation. As a result, everything that has been sent to PF earlier, including the SOF **Peter**, will be contained in a deaccenting domain. The pitch accent assigned to the SOF is obliterated due to the deaccenting rule (25b), while the lengthening effect on the SOF remains. This is the result we wanted. So far so good.

(29) **Spell-Out of entire CP (Root Spell-Out)**

13
Once we try to account for the prenuclear SOF, however, we run into a problem.

(30) **SOF: Prenuclear**

\[[\text{CP Nur } [\text{CP[Péter_{SOF}]] hat [TP t_i [\text{vP sogar }] [vP einen Anzug_{FOF} ge tragen]]]]].

‘Only Peter even wore a suit.’

The problem is, the MSO model predicts exactly the same result as (29) for this sentence, that is, the prenuclear SOF bearing the nuclear pitch accent, while the FOF being deaccented, which is clearly incorrect.

At the vP phase, its Spell-Out domain VP contains the adverb *sogar* and the FOF *einen Anzug*. Hence an FI is created.

(31) **Spell-Out of VP**

\[[\text{VP eines Anzug}_{FOF} ge tragen]].

At the root Spell-Out, the other focus-sensitive adverb *nur* and the SOF *Peter* are sent to PF. A new FI is created. This FI, however, will incorrectly deaccent the FOF.

(32) **Spell-Out of entire CP (Root Spell-Out)**

\[*[\text{CP Nur } [\text{CP[Péter_{SOF}]] hat [TP t_i [\text{vP sogar }] [vP einen Anzug_{FOF} ge tragen]]]]].

Note that in the MSO analysis, there is no distinction between FOF and SOF. They are both treated as the same kind of creature. Which one becomes the matrix focus or the embedded one is determined simply by the order in which the focus sent to PF. Under this analysis, a focus that is higher in the syntactic structure will always include other foci lower in the structure. Prenuclear SOF cases is problematic, since the SOF, which should not be most prominent, occupies the highest position in the structure, and hence embeds all the other foci in its FI domain.

In order for the MSO model to work properly, the FOF has to be interpreted at the very end of the Spell-Out, i.e., the root Spell-Out. Then it will never be embedded in the other FI. In the next section, we will pursue this line of modification.

### 3.2 Solution: Matrix Focus Effect

The key idea comes from the notion of primary and secondary focus, entertained by Büring (2005).

(33) **Domain Theory of Primacy** (Büring, 2005)

Among two foci in a sentence, primacy is given to that focus whose domain contains that of the other.

In his analysis of SOF, he claims that FOF always bears a focus that is interpreted at the root level, which he calls *free focus* in contrast to associated focus. SOF, on the other hand, only bears an associated focus, whose domain is limited to a smaller part of the sentence. He introduces a constant called *ContextConnect (CC)*, which, together with the focus operator ~ (in the sense of Rooth, 1992) at the root clause, computes free foci in the sentence. CC requires that there be a salient antecedent in the context whose
meaning is an element of the set of propositions introduced by \( \sim \). Which phrase bears a free focus can be calculated using the mechanism proposed by Schwarzschild (1999).

The main point is that FOF always bears a free focus in addition to an associated focus. In the problematic prenuclear SOF sentence, the FOF \textit{Anzug} now has two focus markings, one for the associated focus, the other for the free focus, as in (34).

\begin{equation}
\text{SOF: Prenuclear} \\
[[\text{Nur}_1 \text{Peter}_F] \text{ hat [sogar}_2 \text{ einen Anzug}_F, \text{ getragen}]] \sim_3 \text{CC}
\end{equation}

‘Only Peter even wore a suit.’

In combination with the MSO model, this additional free focus allows the FI of the FOF to be created at the root Spell-Out. FOF will always bear the highest prominence, regardless of it’s location. In (34) above, both SOF \textit{Peter} and FOF \textit{Anzug} creates an FI at the root Spell-Out.

Furthermore, it is also correctly predicted that the SOF bears a pitch accent only if it precedes the FOF. If it follows the FOF, the pitch accent will be eliminated by deaccenting operation triggered by the FOF. Such deaccenting does not take place if the SOF precedes the FOF.

4 Extension

4.1 Paradox

This modification of the MSO model brings some new insights to Japanese data as well. In Ishihara (2005), the intonation patterns of the following sentences were discussed:

\begin{enumerate}
\item \textit{Indirect wh-question, No scrambling}  
\begin{equation}
\text{N\=aoya-wa [ M\=ari-ga n\=ani-o nomiya-de n\=onda ka] imademo} \\
\text{Naoya-TOP Mari-NOM what-ACC bar-LOC drank Q even.now} \\
\text{ob\=oteru} \\
\text{remember} \\
\text{‘Naoya still remembers what\,i Mari drank t\,i at the bar.’}
\end{equation}
\item \textit{Indirect wh-question, Scrambling}  
\begin{equation}
\text{n\=ani-o N\=aoya-wa [ M\=ari-ga t\,i nomiya-de n\=onda ka] imademo} \\
\text{what-ACC Naoya-TOP Mari-NOM bar-LOC drank Q even.now} \\
\text{ob\=oteru} \\
\text{remember} \\
\text{‘Naoya still remembers what\,i Mari drank t\,i at the bar.’}
\end{equation}
\end{enumerate}

(35a) is a simple indirect \textit{wh}-question. We have already seen that the sentence exhibits an FI within the embedded clause, that is, there is a \( \text{F}_0 \)-compression after the boosted \textit{wh}-phrase until the end of the embedded clause (where the the question particle \textit{ka} appears), and then the pitch contour regains its the original range after that.

(35b) is also an indirect \textit{wh}-question, but the \textit{wh}-phrase is scrambled to the beginning of the sentence, i.e., outside the scope of the \textit{wh}-question. Ishihara (2002) and Kitagawa and Fodor (2003) first claimed that the post-focal \( \text{F}_0 \)-compression starts after the scrambled \textit{wh}-phrase, and stops at the end of the embedded clause. The experimental
examination in Ishihara (2005), however, revealed a different result from what Ishihara (2002) and Kitagawa and Fodor (2003) claimed: the post-focal compression continues until the end of the embedded clause.


\[
\begin{array}{c}
[CP \boxed{WH} [TP \ldots [CP [TP \ldots t_{WH} \ldots ] ka] \hat{imademo} \ldots ]] \\
\uparrow \\
\text{Pitch reset}
\end{array}
\]

b. Experimental result in Ishihara (2005)

\[
\begin{array}{c}
[CP \boxed{WH} [TP \ldots [CP [TP \ldots t_{WH} \ldots ] ka] \hat{imademo} \ldots ]] \\
\uparrow \\
\text{F}_{0}\text{-reduction}
\end{array}
\]

The original MSO model predicts (35b), the one actually observed in the experimental result. It remains to be a mystery, however, why both Ishihara (2002) and Kitagawa and Fodor (2003) claimed that (35a) is the correct pattern. I, as a native speaker, still feel that (35a) is not entirely impossible.

 Büring’s (2005) idea of primary focus might provide a hint to this problem. It is plausible to imagine that in an experimental condition where no context was presented to the speakers, the matrix free focus would be assigned to the only focused phrase in the sentence, namely, the scrambled wh-phrase. Accordingly, the wh-phrase will create an FI at the root Spell-Out. Such an FI will include the entire sentence in its post-focal F_{0}-compression, as in (37b).

In the discussion by Ishihara (2002) and Kitagawa and Fodor (2003), on the other hand, the authors are fully aware of the scope domain of the indirect wh-question. In such a case, it is possible to assign an additional free focus to the matrix material after the embedded clause, i.e., the adverb \hat{imademo} ‘even now’ in (35b).

(37)  a. In Ishihara (2002); Kitagawa and Fodor (2003): Free focus on a matrix material

\[
\begin{array}{c}
[CP \boxed{WH}_{F,1,2} [TP \ldots [CP [TP \ldots t_{WH} \ldots ] ka_1] \hat{imademo}_{F,2} \ldots ]] \sim_2 CC \\
\uparrow \\
\text{Pitch reset}
\end{array}
\]

b. Experiment in Ishihara (2005): focus only on the wh-phrase

\[
\begin{array}{c}
[CP \boxed{WH}_{F,1,2} [TP \ldots [CP [TP \ldots t_{WH} \ldots ] ka_1] \hat{imademo} \ldots ]] \sim_2 CC \\
\uparrow \\
\text{F}_{0}\text{-reduction}
\end{array}
\]

This somewhat speculative explanation can be only confirmed by rerunning an experiment with a better control on the existence/absence of free focus. However, the notion of free focus allows us to provide a potential solution to the paradoxical situation.
5 Conclusion

In this paper, we discussed two types of embedded foci, which have been considered to be ‘inaudible’. As many researchers have already shown, these foci do have phonetic realization of EFi, hence not really ‘inaudible’. Their phonetic realizations are embedded inside the phonetic realization of other focus that has a broader FI domain. When the EFi get out of the FI domain of the other focus, e.g., by preposition, then the focus is realized normally.

The MSO analysis proposed Ishihara (2003), which is proposed for various FI phenomena in Japanese wh-questions, is modified to extend it to German SOF data discussed by Féry and Ishihara (2005), based on the idea of free focus proposed by Büring (2005). This modification brings welcome results, not only for the German SOF data, but also for a paradoxical situation between the speakers’ intuition about the pitch contour of the sentence in (35) and the experimental result in Ishihara (2005).

References


