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Embedded Tense: Insights from Modern Greek

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Abstract

Embedded tense in Modern Greek (MG) displays an unexpected ‘optionality’: both present and past tenses can be used under a past tense attitude verb to convey a simultaneous reading. We claim that MG has a mixed tense system, being able to delete the embedded past like English and shift the embedded present like Russian. Are these two the only routes to the simultaneous reading in MG? We claim that sometimes there is a third one, namely interpreting the embedded past with respect to the time of the utterance. Based on a cross-linguistic investigation of the availability of simultaneous readings in languages without a deletion rule, we provide evidence that there is variation, both across languages and across speakers. We provide an analysis using a pragmatic *Prefer De Se* principle and a syntactic *Prefer Local Binding* parameter. The first states that *de se* readings are preferred whenever possible, be they obtained via *de se* Logical Forms or via *de re* ones with temporal descriptions that happen to be *de se*. *Prefer Local Binding* expresses a preference for locally bound temporal variables, therefore giving rise to a back-shifted reading of past-under-past in the absence of a deletion rule. Based on data from ellipsis, we argue that in MG this parameter is inactive, and thus MG has a third route to the simultaneous reading. Finally, we introduce the ‘*then*’-present puzzle, namely the observation that ‘then’ is incompatible with the shifted present. We extend Ogihara & Sharvit’s (2012) and Vostrikova’s (2018) paradigm for Hebrew and Russian, arguing that the puzzle holds not only for present-under-past but also for present-under-future environments cross-linguistically, both under attitude verbs and in relative clauses. Furthermore, we provide novel data, and conclude that the puzzle also holds in a mixed tense language like MG. Finally, we show that ‘then’ is compatible with the present in other environments and we argue against competition-based accounts, leaving the puzzle open.

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Declaration of Originality

The originality of this thesis lies not only in the novel linguistic data and empirical generalizations, but also in the theoretical analysis. We provide novel data pertaining to embedded tense from elicitations as well as from an experiment in Modern Greek. What is more, we have new cross-linguistic data and generalizations with respect to the availability of the simultaneous reading under past tense attitude verbs. We also bring attention to the generalization that 'then' is incompatible with shifted present, extending it to present-under-future as well as to Modern Greek. From a theoretical point of view, we provide a new analysis of the availability of simultaneous readings cross-linguistically inspired from *Prefer De Se*, predicting our new generalizations, as well as cross-linguistic variation within non-SOT languages. Finally, we draw attention to what we call the *'then'-present puzzle*, refuting some plausible accounts and drawing attention to its theoretical importance for a uniform semantic treatment of shifted present and deleted past.

Declaration of Contribution

The main contributors, apart from myself, are my supervisors, Philippe Schlenker and Amir Anvari. It's them who first pointed out Sequence of Tense phenomena to me as well as helped me navigate and understand the relevant literature. They also assisted me with the construction of linguistic data, gave me directions for future research, useful feedback and ideas for the theoretical analysis, as well as feedback on the present thesis. As for the small experiment on Modern Greek tense, not only my supervisors, but also Barbara Hemforth, Emmanuel Chemla and Mora Maldonado assisted with the design and/or the data analysis. Last but not least all the Modern Greek, Russian, Hebrew, Japanese and Farsi consultants have helped with their judgments. I was part of all the above, as well as elicited

the linguistic data, refined the theoretical analysis and wrote the present thesis. I am more than grateful to anyone who in one way or another contributed to this thesis.

1. Chapter 1: Introduction

Temporal features are used to temporally locate an Inflectional Phrase (IP) relative to the time of the utterance or the time of the attitude in case the IP is a complement to an attitude verb. However, temporal features sometimes seem to remain semantically uninterpreted. Consider, for example, the following English sentence:

(1) 2 years ago, John thought that Mary was pregnant.

This sentence has two possible readings, the *simultaneous* and the *back-shifted* one. The former conveys simultaneity between John's thought and the embedded event, i.e., it is used to convey the thought 'Mary **is** pregnant' on John's part two years ago. The latter conveys anteriority of the embedded event relative to John's thought, i.e., it is used to convey the thought 'Mary **was** pregnant'. Schematically, we can represent these two readings as follows¹:

(2) 2 years ago, John thought_{t1} that Mary was_{t1} pregnant.

Simultaneous: John's thought at t1 was 'Mary is pregnant', where t1 is a time interval two years ago

(3) 2 years ago, John thought_{t1} that Mary was_{t2} pregnant.

Back-shifted: John's thought at t1 was 'Mary was pregnant at t2', where t2>t1 and t1 a time interval two years ago

In the simultaneous reading, the embedded past is interpreted as a present tense from the point of view of the attitude holder. Therefore, it seems that the past tense features remain uninterpreted. Similar phenomena have been observed with other features, like phi-features of pronouns. For instance, the most natural interpretation of the following example from Sharvit (2018), often referred to as the *de se* reading, involves using a third-person pronoun to convey a first-person thought, i.e., John's original thought was 'I am self-employed':

(4) John thinks that he is self-employed.

Just like the past in (2) is interpreted as a present from John's point of view, the pronoun 'he' in (4) is interpreted as an 'I'. Therefore, we have two empirical datapoints that look similar: in both cases a certain feature seems to be uninterpreted from the point of view of the attitude holder. One possible theoretical direction is to say that the two datapoints are caused by the same phenomenon: an agreement mechanism making sure that a feature is merely there morphologically but is not semantically interpreted². However, not all languages use agreement to convey simultaneous readings. Some languages, like Hebrew and Russian, directly make use of an embedded present that can be shifted, thus ending up referring to the 'now' of the attitude holder rather than the time of the utterance.

In this thesis, we will focus on simultaneous readings obtained via an uninterpreted past (as we saw above in English) or via a shifted present (as we will see below) cross-linguistically. Firstly, we will give an empirical description of Modern Greek (MG), establishing that it has both ways to obtain a

¹ This is just an expository device, not intended to carry theoretical commitments.

² Of course, another theoretical possibility is that the two are distinct phenomena. It could also be that the two are related to the same phenomenon but that the latter is not agreement. At this point, we are not yet committed to any theoretical assumptions.

simultaneous reading. Building on Schlenker (1999) and Sharvit (2003; 2018), who have briefly mentioned the optional Sequence of Tense (henceforth SOT) of MG, we will provide novel data, confirming that it has both a tense deletion rule and a shiftable present under past tense attitudes. What is more, we will complete the characterization of MG present tense in the cross-linguistic typology of embedded tense, claiming that it behaves like Russian and unlike Japanese, since our data suggest that it does not shift in non-attitudinal environments. What is more, we will discuss the theoretical implications of these data in conjunction with the cross-linguistic picture from Hebrew and Russian, providing a preliminary analysis in terms of *Prefer De Se*. Afterwards, we will provide novel cross-linguistic data, discussing the availability of simultaneous readings with past-under-past in various non-SOT languages, such as Russian, Hebrew and Farsi. These empirical generalizations will motivate a new analysis based on modified *Prefer De Se* and a new *Prefer Local Binding* principle. Finally, we will introduce the ‘*then*’-present puzzle, namely the observation that the temporal pronoun ‘then’ is incompatible with shifted present cross-linguistically.

1.1. The tense deletion parameter

In this sub-section, we will introduce the SOT rule. The SOT rule is the mechanism that deletes the embedded past tense features in (1), giving rise to the simultaneous reading. We will see that SOT languages, like English, which have such a rule, convey a simultaneous reading with past-under-past. On the contrary, non-SOT languages, like Hebrew, which lack an SOT rule, convey a back-shifted reading with past-under-past, since the most embedded past remains interpreted.

Importantly, notice that in principle there are two ways³ to obtain the simultaneous reading with past-under-past. We could either interpret the embedded past relative to the time of the utterance or semantically delete it and interpret it as a zero-tense relative to the local ‘now’ of the attitude holder. The first mechanism yields a temporal *de re* readings and the second a temporal *de se* one. Consider the two different Logical Forms (henceforth LFs) for (2)⁴:

- (5) [2 years ago] λt_1 John think^{past}_t1 λt_0 that Mary be^{past}_t1 pregnant *de re*
 (6) [2 years ago] λt_1 John think^{past}_t1 λt_0 ^{past} that Mary be^{past}_t0 pregnant *de se*

In the former case, the embedded past tense is indeed interpreted, but not with respect to John’s temporal perspective. It is rather interpreted with respect to the same temporal perspective as the matrix past tense is. On the contrary, in the latter case, the embedded past tense is read *de se*, i.e., with respect to John’s local ‘now’, yet is deleted via an SOT rule (which we will provide shortly). Therefore, we end up with a zero tense, thus getting the truth conditions that t0 is simultaneous with t1, which on its turn precedes the time of the utterance by 2 years. If the past tense is not deleted, this

³ There are pragmatic accounts of SOT phenomena (e.g., Altshuler and Schwarzschild (2013), Altshuler (2016)), but as we will see in section 2, Modern Greek poses a challenge to such accounts. Therefore, we adopt a semantic perspective in the present thesis.

⁴ We will provide simplified LFs throughout the whole thesis. Additionally, we represent tense features as superscripts by analogy with other presuppositional features, such as gender features. We take the t0 parameter to be the perspectival point, i.e., the ‘local now’ to use the terminology of Abusch (1988) and Heim (1994a) and t* to be the time of the utterance.

LF yields a back-shifted reading, in the sense that the event described by the embedded verb is understood to have happened prior to John's thinking.

At this point, we should mention that there are two ways to implement an SOT rule that accounts for temporal *de se*. One is by feature deletion under c-command (e.g., Ogihara (1996), Sharvit (2003;2018)), another is by feature transmission under agreement (e.g., Abusch (1997), Grønn and von Stechow (2010)). Semantically, whether a feature is deleted or inserted will not make any difference, so for the purposes of this thesis, we will follow Ogihara (1996) and Sharvit (2003; 2018) in stating the SOT rule in terms of feature deletion, as illustrated in (6).

But why would we posit an SOT rule in the first place if we can explain the data in terms of temporal *de re*? In other words, why say that the embedded past is uninterpreted with respect to the attitude holder's temporal perspective, when we can say that it is interpreted with respect to the same perspective as the matrix past is? Abusch (1994; 1997) argues that an SOT rule is needed, because temporal *de re* cannot account for all attested simultaneous readings (see also Ogihara (1996), von Stechow (1995; 2003)). She provides the following example (reconstructed from Kamp & Rohrer (1983)):

- (7) John decided a week ago that in ten days he would say to his mother that they were having their last meal together.

The most salient reading of this sentence in English is the simultaneous one, according to which John will say to his mother in three days from the time of the utterance 'We **are** having our last meal together'. The temporal relations are thus understood in the following way:

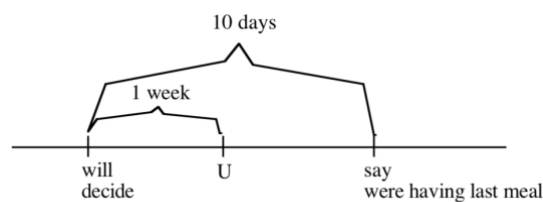


Figure 1: Temporal relations in (7). Picture by Abusch (1994).

For Abusch, U is the time of the utterance (what we will later denote as t^*). Notice that the time of the meal is after any other time in the sentence. This example demonstrates that the embedded past tense can under certain circumstances remain uninterpreted. Indeed, if past tense features were computed semantically, the most embedded past tense, 'were having', would have to denote a point in time anterior to (i) the time of the utterance (*de re* interpretation) or (ii) the time of the saying (*de se* interpretation), i.e., the so-called back-shifted reading. Yet, the temporal relationships are understood in a way that excludes both (i) and (ii): the embedded past does not refer to any past moment at all, be it relative to the attitude holder's 'now' or the time of the utterance. Therefore, it seems that the past tense is only there for morpho-syntactic reasons, being in a sense 'deleted' in the semantic computation. Thus, we need to posit an SOT rule, namely an agreement rule in the domain of tense, which would delete the past tense features at the level of the LF. Such features would be a

mere agreement marker with the c-commanding matrix past. Here is the simplest form of such an SOT rule (reconstructed from Ogihara (1996), Sharvit (2018)):

Under certain circumstances, when a tense morpheme is c-commanded by an agreeing tense morpheme (attached to an intensional predicate), it may be deleted at the level of the LF.

Definition 1: SOT rule

According to this rule, a past embedded under a past tense attitude verb is morphologically present, but not semantically interpreted. Whenever a language has such an agreement rule, it is considered an SOT language⁵. Yet not all languages display tense agreement. English and French for example are SOT languages, while Russian, Hebrew and Japanese are non-SOT ones. When there is an SOT rule, the embedded past-under-past may be semantically non-past, i.e., deleted at LF. Past tense features are transmitted through the binder to the embedded verb with the bound time variable, but are then deleted by the SOT rule at the LF. That is precisely what happens with (7), as seen in the following LF:

(8) [a week ago] λt_1 John decide^{past} $_t1$ λt_0 ^{past} he will^{past} t_0 say $_t0$ that they have^{past} $_t0$ their last meal together.

By contrast, in non-SOT languages, where there is no agreement rule, all tense features are semantically interpreted. As we saw, an embedded past can be interpreted either *de re* or *de se*. In this example, however, where the *de re* reading is blocked since the embedded past is not prior to the time of the utterance, the past-under-past sentence would necessarily get the back-shifted reading. In other words, a non-SOT version of (7) would have the embedded past expressing anteriority with respect to the c-commanding one. We will see this more extensively in section 3, but for (7) to be true in Hebrew for example, John would have to say in three days from now to his mother via the phone ‘We were having our last meal together’. Consider the following example from Hebrew (Sharvit 2003):

(9) Lifney šavua, Dan hexlit še be’od asara yamim, bizman aruxat ha-boker,
Before week Dan decide-PST that in ten days at-time food the-morning
 hu yomar le-imo še hu hitga’agea ele-ha.
he will-tell to-his-mother that he miss-PST to-her
 ‘Dan decided a week ago that in ten days at breakfast he would say to his mother that he missed her’

In this case, what Dan will say in three days is ‘Mom, I missed you’. Hebrew being a non-SOT language, the most embedded past is interpreted, expressing anteriority with respect to the time of his utterance. This is reflected in the LF, since all past tense features are indeed interpreted:

(10) [Before one week] λt_1 Dan decide^{past} $_t1$ λt_0 he will $_t0$ say $_t0$ he miss^{past} $_t2$ her.

In other words, whenever a language does not have an SOT rule, such as Hebrew, Russian, and Japanese, examples like (9), where the *de re* reading of the embedded attitude is false, must have a back-shifted reading. Whenever a language has an SOT rule, however, such as English and French, the

⁵ We should mention at this point that in our discussion of SOT, we will use statives, since eventive predicates often block simultaneous readings for aspectual reasons, independently of tense (Stowell (2007), Altshuler (2016)).

embedded past may be deleted at the level of LF and therefore a *de se* simultaneous reading becomes possible.

This inevitably raises two complementary questions:

- a. How do SOT languages, like English and French, express the back-shifted reading?
- b. How do non-SOT languages, like Hebrew, Russian and Japanese, express the simultaneous reading?

One strategy used by SOT languages to get a back-shifted reading is by adding an extra layer of past tense, one that is not deleted by the SOT rule. So, the equivalent of (9) in English would be:

(11) Dan decided a week ago that in ten days he would say to his mother that he had missed her.

Another possible strategy to get a back-shifted reading is using a temporal operator or a phrase referring to a moment before the time of the attitude:

(12) Dan decided a week ago that in ten days he would say to his mother that he greatly missed her when he was a child.

(13) Anne a dit en 1960 qu'en 1900 son grand-père était très pauvre.

Ann has say-PST in 1960 that-in 1900 her grandfather is-PST very poor.

'Ann said in 1960 that in 1900 her grandfather was very poor'

As far as simultaneous readings in non-SOT languages are concerned, a shiftable present tense is used. This parameter will be discussed in the following section.

1.2. The shiftable present parameter

A separate question that arises is whether a present-under-past sentence allows for simultaneous readings. In other words, can the embedded present tense in a given language refer to the same moment as the matrix past tense? This will depend on whether the present tense is shiftable, in the sense that it can refer to the local 'now' of the agent in indirect discourse (possible in Hebrew, Russian and Japanese, often impossible in French and English). If a non-SOT language also has a shiftable present tense, then the simultaneous can be expressed with a present-under-past. Non-SOT languages usually achieve the simultaneous reading via a shiftable present indeed. As for non-attitudinal environments, such as relative clauses, there is a further sub-division; Hebrew and Russian present tenses do not shift in such environments, while the Japanese present does.

Standard SOT languages, like English and French, on the contrary have an indexical or non-shiftable present, which has to be evaluated at the time of the utterance. This does not necessarily mean that present-under-past sentences are ungrammatical. Rather, it means that the embedded present must be interpreted (at least partially) with respect to the time of the utterance, i.e., it must be evaluated at the time of the utterance. Such sentences have the so-called 'double-access' reading. Consider the following example:

(14) John knew that Mary is pregnant

This sentence in English only has the (double-access) reading that John knew at some past moment preceding the time of the utterance⁶ the following: ‘Mary is pregnant’ and in fact she still is at the time of the utterance (since the present is indexical). In other words, the pregnancy spans over an interval, starting from the past moment expressed by the matrix verb and following up to the time of the utterance, i.e., our ‘now’. We will not discuss double-access readings further in this thesis, since our focus will be genuinely shifted present. In fact, we will try to systematically block double-access readings⁷ via the use of temporal operators, such as:

(15) #20 years ago, John knew that Mary is pregnant.

Does that mean that the English present tense is purely indexical? As a matter of fact, the English present tense can shift under ‘will’:

(16) In 15 years, Laura will collaborate with people who work for the government.

However, this is the case for all languages that we will discuss. For the moment, we leave this aside, and discuss shifting under past tense matrix verbs. In the following sub-sections, we will focus our discussion on non-SOT languages, which have a shiftable present tense. We will discuss the typology, observing that while Russian and Hebrew present tense only shift under attitude, the Japanese one shifts everywhere.

1.2.1. Attitudinal environments

Unlike in English, in non-SOT languages the present tense shifts under past tense attitude verbs⁸. Indeed, this is the mechanism languages without a feature deletion rule use to express a simultaneous reading. Here’s an example from Hebrew found in Ogihara & Sharvit (2012):

(17) Lifney alpayim šana, Yosef gila še Miriam ohevet oto.
Before 2,000 year Yosef find-out-PST that Miriam love-PRS him.
 ‘2,000 years ago, Yosef found out that Miriam loved (literally: loves) him’

In this example, the indexical reading of the present tense (and thus the double-access reading too) is blocked by the temporal operator ‘2,000 years ago’. Indeed, the embedded present cannot be read indexically relative to the time of the utterance, i.e., t^* , since this would imply that Miriam loves Yosef now, 2,000 years later, which is implausible. The only plausible LF for (17) would thus be:

(18) [before 2,000 years] λt_1 Yosef find-out^{PAST} $_t1 \lambda t_0$ [that Miriam love $_t0$ him.]

In other words, the present tense is interpreted relative to Yosef’s local ‘now’. What he found out is: ‘Miriam loves me (now)’. The exact same pattern is observed in Japanese (Ogihara & Sharvit (2012)):

(19) Taroo-wa Hanako-ga byooki-da-to itta.
Taro-TOP Hanako-NOM is.sick-COMP say-PST.

⁶ The interval of evaluation has to include John’s ‘now’, because of the Upper Limit Constraint, which we do not discuss here (Abusch 1988; 1994, Heim 1994a).

⁷ We assume that temporal operators (such as ‘20 years ago’) in conjunction with properties that do not last long (such as a pregnancy) block the reading according to which the property holds at the time of the utterance. Thus, we block the double-access reading. Note that such sentences could still have the meaning that the agent knew 20 years ago something that happens now. But this meaning would be odd, hence the # symbol.

⁸ Even when double-access readings are blocked.

‘Taro said that Hanako was (literally: is) sick’

This present-under-past sentence has a simultaneous reading and crucially does not have to have a double-access one (unlike its English equivalent). What Taro said in the past is ‘Hanako is sick’ and Hanako may or may not be sick right now. Finally, the same is observed for Russian, which has a null present tense (Grønn & Stechow 2010):

(20) Vse govoreli, čto Channa dočka Stine.

They say-PST, that Channa child Stine.

‘They said that Channa was (literally: is) Stine’s child’

Thus, it seems that languages with an SOT rule, at least those described so far, use a matrix indexical present (Schlenker 1999; Sharvit 2003), namely a present tense morpheme which obligatorily refers to the utterance time. By contrast, non-SOT languages use a shiftable present tense morpheme to derive the simultaneous reading. A shifted present in an attitudinal environment refers to the ‘internal now’ of the attitude holder, thereby conveying the simultaneous reading. From a theoretical perspective, there are thus two parameters:

- (i) A deleted past
- (ii) A shiftable present

These predict the following typology under attitudes (Sharvit, 2003; 2018):

Table 1: Typology under attitudes

Parameters	English, French	Russian, Hebrew, Japanese	Modern Greek	Unattested
Deleted past	YES	NO	YES	NO
Shiftable present	NO	YES	YES	NO

As we will see in the next chapter, MG is the only language observed so far that has both a deleted past and a shiftable present. Thus, it has two roads to the simultaneous reading. One of the main goals of this thesis is to provide data that establish this, as well as a plausible analysis. Finally, no non-SOT language with an indexical present has been observed. Presumably, in such a language certain readings (such as the equivalent of (7), where a *de re* reading of the past is impossible) would be ineffable. More specifically, Sharvit (2003) argues that this is due to an Embeddability Principle of Universal Grammar, according to which every well-formed matrix sentence should be embeddable under an attitude verb. For reasons of time and space, we will not speculate any further as to why such a language type is unattested.

1.2.2. Non-attitudinal environments

However, we could still wonder what happens with the present tense in non-attitudinal environments, like relative clauses. If the present tense is shiftable in a given language, will it still shift in extensional environments not involving an attitude report thus having no ‘local now’? The answer is not necessarily: there is a further division between languages where the present is shiftable: those where it is so only in attitudinal environments, like Russian and Hebrew, and those where it is also shiftable in non-attitudinal, relative clause environments, like Japanese. In the following sections, we will provide novel data and argue that MG falls under the first category. To give a concrete example, present-under-past may be used in relative clauses to refer to a past moment in Japanese, but not in Russian. The following Japanese sentence from Ogihara & Sharvit (2012) has two possible readings:

(21) Joseph-wa ryokoo-o aisuru zyosei-ni atta.
Joseph-TOP travelling-ACC love-PRS woman-DAT meet-PST
 ‘Joseph met a woman who loved (literally: loves) travelling’

It has a simultaneous reading, according to which the woman loved travelling when they met (not necessarily now) as well as an indexical reading, according to which the woman loves travelling now (not necessarily when they met). On the contrary, present-under-past in relative clauses in Russian, English, Hebrew (and MG as we will argue) can only give rise to unshifted readings. Such sentences only have the indexical reading as illustrated by the Hebrew example (Ogihara & Sharvit 2012):

(22) Be-yalduto pagaš Yosef iša še ohevet letayel.
In-childhood meet-PST Yosef woman that love-PRS traveling
 ‘In his childhood, Yosef met a woman who loved (literally: loves) traveling’

This means that the woman must love traveling now, at the time of the utterance (not necessarily in Yosef’s childhood). To summarize, we have the following typology:

Table 2: Shiftable present typology in non-attitudinal environments

	Japanese	English, Russian, Hebrew, MG
Shiftable present	YES (optionally)	NO

In the following chapter, we will complete the characterization of the MG present tense, arguing that it behaves like Russian and unlike Japanese.

1.3. Claims about Modern Greek

As we will see in Chapter 2, MG displays an interesting ‘optionality’, in that both the present and the past may be used under a past tense attitude verb to trigger a simultaneous reading (Schlenker 1999, Sharvit 2003; 2018). We claim that MG has a mixed tense system, displaying the tense deletion of English and the shiftable present of Russian. Specifically, with respect to the present, MG is like Russian, the present tense being shiftable in attitudinal environments (ex. ‘2 years ago, John said_t that Mary is_t pregnant’). With respect to the past, MG is like English, since it has an SOT rule, deleting the most embedded past (ex. ‘John said_t that Mary was_t pregnant’). Therefore, there are two ways to obtain a *de se* LF in MG: through a deleted past tense or a *de se* present tense. In both cases the embedded tense is evaluated with respect to the ‘now’ of the attitude holder. We will also claim that the present tense is not shiftable in non-attitudinal environments, providing data from a small experiment that support this hypothesis. Finally, we will draw attention to the ‘*then*’-present puzzle, showing that ‘then’ is incompatible with the shifted present. Throughout the whole thesis, we will make cross-linguistic comparisons, discuss simultaneous readings in other languages, as well as use cross-linguistic data in our analysis.

2. Chapter 2: Sequence of Tense in Modern Greek

In this chapter we will focus on SOT phenomena in MG, placing it in the typology and providing an analysis for the observed generalizations. More specifically, we confirm what Schlenker (1999) and Sharvit (2003; 2018) have mentioned, namely that MG displays an optional SOT rule: both a present- and a past-under-past can be used to convey a simultaneous reading, even when *de re* readings are blocked. We provide an analysis motivated by cross-linguistic data from non-SOT languages, arguing that MG has two *de se* roads to the simultaneous reading. What is more, we further characterize MG present tense, establishing that it is only shiftable in attitudinal environments, while providing experimental data for this claim.

2.1. Modern Greek data

We will provide MG data to establish that the present tense is shiftable and there is an SOT rule in attitudinal environments. All data report our native judgments as well as those of four other native speakers, unless stated otherwise. Also, assume there was unanimity in judgments, unless stated otherwise. The consultants heard the sentence pronounced by a native speaker and were asked to make a binary acceptability judgment (acceptable/unacceptable). The raw data can be accessed here: https://docs.google.com/spreadsheets/d/1CthMJ0KPU_cMMfd8wogtMmJqPOPx1gxKnXKMB8MsQP_E/edit?usp=sharing

2.2. Attitudinal environments

Shiftable Present

MG present tense is shiftable in attitudinal environments, like Hebrew and unlike English. That is, a present tense embedded under a past tense attitude verb can be read *de se*, i.e., evaluated with respect to the ‘now’ of the attitude holder. This is illustrated in the following examples⁹, where double-access readings have been blocked using temporal operators:

- (23) To 1960, o Yanis iksere oti i Maria ine omorfi.
The 1960, the Yanis know-PST that the Maria is-PRS beautiful
‘In 1960, Yanis knew that Maria was (literally: is) beautiful’
- (24) Prin dheka khronia, i Maria mu ipe oti ine enkios.
Before ten years the Maria to-me tell-PFV-PST that is-PRS pregnant
‘Ten years ago, Maria told me that she was (literally: is) pregnant’

⁹ In glosses and MG transcriptions, we will use the following conventions:

FUT – future	γ = j (word initially) / gh (word medially) / g (before v)
IPFV – imperfective	δ = dh (d before ρ)
PFV – perfective	θ = th
PRS – present	χ = kh
PST – past	γκ = g (word initially) / nk (word medially)
NEG – negation	μπ = b (word initially) / mp (word medially)
SBJV – subjunctive	ντ = d (word initially) / nd (word medially and word finally) / nt (in ντζ)

Both sentences have a simultaneous reading: what Yanis knew is ‘Maria is beautiful’ and what Maria told me is ‘I am pregnant’. The embedded present is shifted, being evaluated with respect to the ‘now’ of the attitude holder. Therefore, MG present tense, unlike English present tense¹⁰, can be shifted in attitude reports.

Simultaneous readings with past-under-past

Having established that present-under-past can trigger a simultaneous reading under attitudes verbs, two questions arise:

- (i) Does past-under-past also have a simultaneous reading in Modern Greek?
- (ii) If so, does it still have a simultaneous reading in situations in which a *de re* reading of the embedded past tense is false? In other words, does it have an SOT rule?

We will see that the answer to both questions is ‘yes’. In fact, the most salient reading of simple past-under-past sentences is the simultaneous one:

(25) To 1960, o Yanis iksero oti i Maria itan enkios.
The 1960, the Yanis know-PST that the Maria is-PST pregnant
 ‘In 1960, Yanis knew that Maria was pregnant’

What John knew is ‘Mary is pregnant’. The back-shifted reading is possible too, yet it is considerably less salient and would require a contextually salient interval preceding 1960 to be licensed.

However, as we discussed in Chapter 1, the simultaneous reading of simple past-under-past sentences like (25) can be accounted for by a *de re* LF. That is, it could be that there is no SOT rule, but that the most embedded past is interpreted with respect to the t^* , i.e., the time of the utterance, rather than with respect to the local ‘now’ of Yanis. We are going to provide an example from the literature, where such a *de re* interpretation of the past is false and yet a simultaneous reading is accessible. Then, following the same reasoning that we used for English, we will argue that MG has an SOT rule in addition to a shiftable present tense. Therefore, the past tense features of the embedded tense can be a mere morphological agreement marker.

Consider the following example from Sharvit (2018):

(26) Prin mia evdhomadha, o Jorghos ipe oti se dheka meres tha
Before one week the Jorghos say-PST that in ten days will
 eleghe stin kopela tu oti sinadjiondusan ja teleftea fora.
say-IPFV-PST to-the girlfriend of-his that meet-IPFV-PST for last time
 ‘A week ago, Jorghos said that in ten days he would say to his girlfriend that they were meeting for the last time’

What Jorghos planned to say is ‘We are meeting for the last time’; the embedded past remains uninterpreted. Therefore, this sentence has the simultaneous reading, despite the past tense features on the most embedded verb. Importantly, ‘were meeting’ cannot be read *de re* in this case since the time of the meeting is not anterior to the time of any salient moment (including the time of the

¹⁰ As mentioned in chapter 1, the English present tense can only give rise to *double-access* readings. For (23), this would mean that Yanis knew that Maria was beautiful in 1960 and he still knows that she is beautiful today. In MG, he need not know so today. The sentence would be compatible with a scenario where Maria is now dead.

utterance); the meeting will take place in three days from the time of the utterance. Therefore, the fact that a simultaneous reading is possible can only be explained with the existence of an SOT rule, which deletes the past tense features at the level of the LF. Up until now, this is exactly the reasoning we had applied to English.

What is interesting in MG, however, is that there is another way to express (26), namely using the shifted present:

(27) Prin mia evdhomadha, o Jorghos ipe oti se dheka meres tha
Before one week the Jorghos say-PST that in ten days will
 eleghe stin kopela tu oti sinadjiondude ja teleftea fora.
say-IPFV-PST to-the girlfriend of-his that meet-PRS for last time
 ‘A week ago, Jorghos said that in ten days he would say to his girlfriend that they were
 (literally: are) meeting for the last time’

What is more, it is worth noting that there is no preference for one or the other strategy to get a simultaneous reading: MG displays complete optionality. We therefore confirm what Schlenker (1999) and Sharvit (2003; 2018) have mentioned, namely that MG displays an optional SOT.

In section 2.2., after we complete the characterization of MG present tense, we will give an analysis of these data, claiming that MG has a mixed tense system. The observed optionality is a result of (i) a tense deletion rule (as in English) and (ii) a shiftable present tense (as in Hebrew/Russian).

2.1.1. Non-attitudinal environments

As mentioned in section 1.2.2., there is a further sub-division between languages that have a shiftable present tense: there are Russian-type languages, where the present tense shifts only in attitudinal environments, and Japanese-type ones, where the present tense may shift everywhere. We provide data that establish that MG is a Russian-type language.

We’ve established that MG present tense is shiftable in attitudinal environments, referring to the ‘now’ of the attitude holder rather than the utterance time. Is the present tense also shiftable in non-attitudinal environments? Relative clauses qualify as such; indeed, present-under-past may be used to also trigger a simultaneous reading in relative clauses in Japanese, but not in Russian, Hebrew or English. In these languages, using present-under-past in relative clauses only gives rise to an indexical reading, meaning that the present tense is interpreted at the time of the utterance, behaving like a matrix indexical. For example:

(28) Mark met the woman who is smiling

This can only mean that the woman is smiling at the time of the utterance, and hence has an indexical reading. Importantly, it cannot convey the meaning that ‘John met_t a woman who is_t smiling’. The same is observed in Hebrew (Ogihara & Sharvit, 2012):

(29) Be-yalduto pagaš Yosef iša še ohevet letayel.
In-childhood meet-PST Yosef woman that love-PRS traveling
 ‘In his childhood, Yosef met a woman who loves traveling’

This sentence means in Hebrew that the woman loves travelling right now, at the time of the utterance. The same is true for the Russian present tense, as illustrated by the following examples (also discussed in Altshuler (2016)):

- (30) Maša videla človeka, kotoryj plačet.
Masha saw person who cry-PRES
 'Masha saw a person who is crying.' (Kondrashova, 2005)
- (31) Často slučalos', čto Miša plakal /#plačet.
Often happened that Misha cry-PST /cry-PRES
 Intended: 'It often happened that Misha cried.' (Schlenker, 1999)

In the former case, the present tense is read indexically, i.e., the person is crying at the time of the utterance. In the latter case, the present tense is infelicitous, since an indexical reading is ruled out by the operator 'it often happened'. MG present-under-past in relative clauses behaves primarily like English, Hebrew and Russian. Consider the following example:

- (32) # Prin 20 khronia o Pavlos sinerghastike me enan andra pu
Before 20 years the Pavlos collaborate-PFV-PST with a man who
 ine proedros, ke o opios ine tora stin syntaxi.
is-PRS president, and the who is-PRS now to-the retirement
 Intended: '20 years ago, Pavlos collaborated with a man who was (literally: is) president, and who is now retired'

This example is semantically deviant since the indexical reading is blocked. The only reading of the embedded present is one according to which the man is president at the time of the utterance, which is however incompatible with him being retired. Going one step further, the same point can be made in complement clauses that appear under non-attitudinal constructions:

- (33) # Ta perasmena khristughena, sto ikogheniako trapezi, itan psemata
The last Christmas at-the family table is-PST lies
 oti i Anula ine lipimeni.
that the Anula-diminutive be-PRS sad.
 Intended: 'Last Christmas, at the family table, it was not true that Anula is sad'

The indexical reading is also blocked here by the temporal operator 'last Christmas' and thus the example is deviant, since it does not have a simultaneous reading. This example with the complement clause is particularly important since it demonstrates that the phenomenon is purely semantic. In other words, it is not the case that present tense *systematically* shifts in complement clauses. It only shifts if the complement clause is preceded by an attitude verb. In fact, the simultaneous reading re-appears with past-under-past, in both relative clauses and complement clauses under non-attitudinal constructions:

- (34) Prin 20 khronia o Pavlos sinerghastike me enan andra pu
Before 20 years the Pavlos collaborate-PFV-PST with a man who
 itan proedros, ke o opios ine tora stin syntaxi.
be-PST president, and the who is-PRS now to-the retirement
 '20 years ago, Pavlos collaborated with a man who was president, and who is now retired'
- (35) Ta perasmena khristughena, sto ikogheniako trapezi, itan psemata
The last Christmas at-the family table is-PST lies
 oti i Anula itan lipimeni.
that the Anula-diminutive be-PST sad.
 'Last Christmas, at the family table, it was not true that Anula was sad'

Therefore, it seems that MG has a Russian- rather than a Japanese-type present tense, since it disallows shifting in non-attitudinal environments.¹¹ We should note here that unlike the relative clause, the complement clause was not unanimously acceptable (3 out of 5 consultants accepted it), even with an embedded past. This disagreement in judgments motivated an experimental investigation, which we will present in the following sub-section.

2.1.2. Complement clauses in non-attitudinal environments

As previously noted, complement clauses in attitudinal vs. non-attitudinal environments are particularly informative since they show us that the shiftability of present tense does not depend on syntactic cues. However, our consultants did not find complement clauses in non-attitudinal environments perfect, even when past-under-past was used, as in (35). Therefore, we decided to collect more judgments in a systematic way, conducting a small experiment. The research question we attempted to answer in this study¹² is ‘How can we express a simultaneous reading under a past tense matrix verb in MG?’. The hypothesis we put forward as an answer to this question is the following: if the matrix verb is an attitude verb, then a simultaneous reading can be obtained both with a present- and a past-under-past. This makes the prediction that judgments for present- and past-under-past will be similar when the matrix verb is an attitude verb. All the code that was used in the experiment and in the analysis, as well as the data files are available on Open Science Framework via the following link: https://osf.io/q6dg2/?view_only=69bb789dbbed4427a419826033b2d845. The pre-registration DOI is the following: [10.17605/OSF.IO/5MRPG](https://doi.org/10.17605/OSF.IO/5MRPG).

Experimental Design

Our hypothesis is that we should see an absence of a difference (between present and past), which corresponds to a null hypothesis and cannot be easily addressed with inferential tests: absence of evidence is not evidence of absence. To circumvent this problem, we investigated an interaction instead, that is a difference of differences. If we expect that attitude verbs will make judgments for present- and past-under-past similar, we expect that other environments will make these judgments dissimilar. Showing that the difference changes when we move away from MG attitude verb environments will therefore show the role of these elements in the phenomenon.

We decided to focus on the role of the attitude verb and to run a Greek internal comparison¹³. There are two possible factors we could contrast attitude verbs with, namely complement clauses under non-attitudinal environments and relative clauses. We decided to use the first factor, to achieve minimal

¹¹ There are some exceptions, involving predicates like ‘see’, ‘look for’, ‘meet’ and ‘talk to’, which however we will not discuss in the present thesis, leaving them open for future research.

¹² Barbara Hemforth, Emmanuel Chemla and Mora Moldanado have also greatly helped (in addition to Philippe Schlenker and Amir Anvari) with this experiment.

¹³ We could also compare present- and past-under-past in MG and in English, since whenever the double-access reading is blocked, present-under-past is predicted to be deviant in English. One methodological problem with doing a cross-linguistic comparison is that we would be using a between-subject design; thus, an observed interaction could be due to other differences between the populations, and it would not be easy to narrowly attribute it to our linguistic construction (e.g., we could not tell whether a similar interaction would be found without an attitude verb).

contrast. Indeed, the use of complement clauses across both factors assured us that if an effect were to be found, it would be a semantic rather than a syntactic one.

Here's a concrete example of the two contrasted factors (attitudes vs. non-attitudes, present vs. past):

(36) *Se mia skholiki ekdromi, prin pola khronia, itan lathos oti i kathighitria eperne / #perni dhiazighio. professor take-IPFV-PST / take-PRS divorce*
'At a school excursion, many years ago, it was false that the professor was/is getting divorced'

(37) *Se mia skholiki ekdromi, prin pola khronia, enas mathitis mandepse oti i kathighitria eperne / perni dhiazighio. the professor take-IPFV-PST / take-PRS divorce*
'At a school excursion, many years ago, a student guessed that the professor was/is getting divorced'

Non-attitudinal constructions followed by complement clauses are predicted to be acceptable only with a past-under-past¹⁴, while attitude verbs are predicted to be acceptable both with present- and past-under-past. The advantage of this contrasting factor is that each item could be presented across all conditions, having a Latin square design. This was possible because a complement clause ('oti' in MG) was used just like under an attitude verb¹⁵.

We thus had a 2 x 2 factorial design, with factors (i) type of environment (attitudinal vs complement clauses) and (ii) tense (past under past or present under past). The experiment used a within-subjects repeated measures design, where each participant provides data for all four conditions. We also controlled for factivity, since most of these constructions seem to be factive, by having an equal number of factive attitude verbs and non-attitudinal complement clause constructions. The experiment was an online judgment task, where participants were asked to judge the acceptability of each sentence on a Likert scale from 1 to 5¹⁶. In total, participants saw 2 practice items, 20 target sentences (the two variants (past/present) of each of 5 different SOT/attitudinal environments and each of 5 non-SOT/non-attitudinal environments), 14 fillers, 2 grammatical and 6 ungrammatical controls. Since the experiment had a Latin Square design, every participant was presented with all conditions but only saw each item in one condition. What is more, the order of the items and the fillers was randomized individually for each participant.

¹⁴ At least a difference between the acceptability of present- and past-under-past would be expected

¹⁵ It is interesting to point out that a lot of these constructions could optionally take either 'oti' (used in complement clauses) or 'pu' (used in relative clauses). For example, we may say in MG 'it was important oti/pu'. In this case, we choose 'oti' to achieve pairs as minimal as possible.

¹⁶ A 5- rather than a 7-point Likert scale is better adapted for Greek participants, for reasons related to the Greek culture and the educational system. For example, the grading system is in multiples of 5 (10- or 20-point scale).

Results

The experiment was run online on the Ibex platform with 26 participants, recruited from social circles, all native speakers of MG, no bilinguals. By 'bilinguals' we mean people who have been exposed to two languages early on, during their first years. Participants in the experiment possibly spoke more than one language, but not natively. They were asked to judge each sentence for acceptability on a scale from 1 to 5. Responses to controls show that the subjects were able to use the whole 5-point scale. Figure 2 presents the results:¹⁷

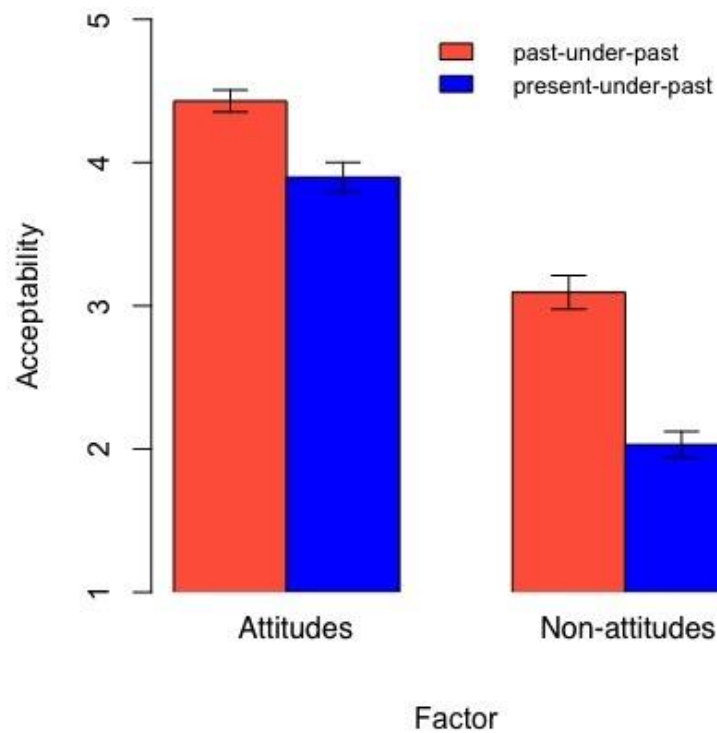


Figure 2: Results from experiment

¹⁷ Item 3 was excluded from the analysis due to a coding error.

In our analysis, we decided to treat the measured variable, i.e., the acceptability judgment, as continuous using a linear model (more specifically the lmer in R). This is a commonly used strategy in the literature. As Figure 2 illustrates, while non-attitudinal constructions are generally less acceptable, present-under-past is significantly worse in the non-attitudinal condition. The linear mixed model (using Satterthwaite's method to compute t-values) showed a significant interaction (beta = 0.56, se = 0.25, $t = 2.2$, $p < .05$, formula: Judgment ~ VtypeC * TenseC + (VtypeC * TenseC || Subj) + (VtypeC * TenseC || Item)) between the type (attitude/non-attitude) and the tense (embedded past/present) factors. We conclude from this that the difference between present and past that we see in attitudes is different than the difference that we see in non-attitudes. There was also an effect of type, as well as an effect of tense. More specifically, we can conclude that non-attitudinal constructions were in general less acceptable than attitudinal ones and that there is an overall preference for past-under-past.

Discussion

We interpret the significant interaction between the type and the tense factors as evidence that present-under-past is only acceptable under attitudes to convey the simultaneous reading. This result shows that in MG, the embedded past is acceptable both under attitudes and non-attitudes alike to convey a simultaneous reading, while the embedded present shifts but only under attitudes. This goes indeed in the direction of the hypothesis tested by this experiment, namely that the difference between embedded past vs. embedded present will be more significant in the case of non-attitudes.

However, our initial hypothesis that we should see an absence of a difference between present and past under attitudes is not directly corroborated, since there is an effect of tense. More specifically, as we've seen in the previous section, there is an overall preference for past-under-past. This preference is expected in the non-attitudes factor, but not in the attitudes one. There are several possible interpretations of this result:

- (i) MG prefers the deleted past over the shiftable present strategy to get the simultaneous reading, or
- (ii) There is a parallelism effect in the line of Frazier et al. (1984) and Carlson (2001), which makes that parallel structures are preferred, or
- (iii) Some participants developed a "choose the matching tense" strategy to solve the task.

While (i) would require a revision of our initial hypothesis, (ii) and (iii) do not. This is because (ii) suggests that there is another effect operating on top of the optionality of present- and past-under-past. This makes the testable prediction that such a parallelism effect should be found in other domains too, as is the case in the literature (Frazier et al. (1984); Carlson (2001)). Yet, (iii) is also a plausible possibility, since after all this strategy would be an efficient way to quickly solve the task. This makes the prediction that there would be between-subjects variation in responses based on whether they used this strategy or not. In a future analysis, we could therefore plot the responses by participant and see if there is such variation. Overall, we have no plausible reason to choose (i), previous literature suggests (ii), and (iii) remains an open possibility. It could also be the case that both (ii) and (iii) are responsible for the observed results.

What about the effect of type? The model showed that non-attitudinal constructions are overall less acceptable than attitudinal ones. This could be an infrequency effect since such constructions are more complex than necessary in a sense and are therefore less frequently used. For example, instead of (36), i.e., 'it was false that x ', one would rather say 'not x '. In follow-up experiments we could control for this by constructing more natural items, or by using relative clauses, which are more frequent, as a contrasting factor.

In general, the main hypothesis tested in this experiment was that there will be a significant interaction between the type and the tense factors, which was indeed what the results and the statistical analysis showed. The difference between embedded present and embedded past is more significant in the non-attitudes factor than in the attitudes one. This was the main result we were interested in, which we interpreted as evidence that present-under-past is only acceptable under attitudes to convey the simultaneous reading. There were also some interesting results pertaining to the type and tense factors, which could give us directions for future research.

2.2. Analysis

In the previous section, we discussed MG data, establishing that MG has an SOT rule as well as a present tense that can be shifted under attitudes only. Importantly, MG displays optionality with both an embedded present and an embedded past being used under a past tense attitude to convey the simultaneous reading.¹⁸

In this section, we will discuss the theoretical implications of these data and provide an account motivated by the cross-linguistic picture. More specifically, the availability of simultaneous readings with deleted past in English and with shifted present in Hebrew, suggest that tense semantics has a *de se* component (Abusch 1988; Ogihara 1996). We will argue that based on MG and English, we could have three rather than two roads to the simultaneous reading: (i) a *de se* deleted past, (ii) a *de re* past and (iii) a *de se* shifted present. Cross-linguistic typology, and more specifically, the fact that a *de re* past is less salient in non-SOT languages, such as Hebrew and Russian, will urge us to adopt a *Prefer De Se* rule, following Ogihara & Sharvit (2012). This will yield the prediction that there are indeed two rather than three roads to the simultaneous reading in MG.

2.2.1. Two or three roads to the simultaneous reading

So far, we have established that MG has an *optional* SOT rule. The embedded past in attitude reports may be semantically deleted, as example (26) showed. However, since MG has a shiftable present tense too, we can also get a simultaneous reading using a present-under-past. Therefore, MG has *two* ways of getting simultaneous readings under past in attitude reports:

a) with **tense deletion**

b) with a **shifted present tense**

Yet, as we explained in the introduction, a *de re* LF of the embedded past can also explain simultaneous readings in simple past-under-past cases. Therefore, there should in principle be three rather than two possible LFs that give rise to the simultaneous reading. Take (24) and (25) for example:

(38) *de re* past-under-past:

[In 1960] **λt1** John know^{past}_t1 **λt0** that Mary be^{past}_t1 pregnant

(39) *de se* shifted present-under-past:

¹⁸ The optionality of MG, which we confirm in the present thesis, is problematic for pragmatic accounts of SOT, such as the Altshuler's & Schwarzschild's (2013) cessation implicature account. According to this account, the back-shifted reading of past-under-past sentences appears as a cessation implicature, whenever a viable present tense alternative is available. However, as Altshuler (2016) states in a footnote (p.136), MG is problematic for this account, since no cessation implicature is triggered, despite a present tense alternative being available.

[In 1960] λt_1 John know^{past}_t1 λt_0 that Mary be^{pres}_t0 pregnant

(40) *de se* past-under-past:

[In 1960] λt_1 John know^{past}_t1 $\lambda t_0^{\text{past}}$ that Mary be^{past}_t0 pregnant

The third road to the simultaneous reading arises if the embedded past is interpreted *de re* and is thus evaluated with respect to the time of the utterance instead of the ‘now’ of the attitude holder. This derives a simultaneous reading without an SOT rule. Based on simple past-under-past sentences in MG and English, we could, therefore, hypothesize the following:

The simultaneous reading with past-under-past is triggered from an embedded past read de re.

However, this would not suffice to account for complicated examples where the *de re* LF is false, since the embedded past tense refers to a moment that has not yet occurred at the time of the utterance, as in (26). Such examples have a simultaneous reading in MG and in English and yet a *de re* interpretation of the most embedded past is blocked. Therefore, if (26) **Error! Reference source not found.** is felicitous and has a simultaneous reading, we need to posit an SOT rule. In other words, not all simultaneous readings are *de re* readings of the embedded past. Some embedded pasts are truly deleted. The question that now remains open is: are there any simultaneous *de re* readings at all in SOT languages?

It could be that a *de re* interpretation of the past tense is available, whenever possible. In other words, we could have three roads to the simultaneous reading in MG, i.e., all three possible LFs are attested, when a *de re* LF is true. We would only have two *de se* roads, when a *de re* LF is contextually blocked. Similarly, in English and in French, it could be that we have two instead of one road to the simultaneous reading, namely a deleted past and a *de re* past. Therefore, cross-linguistic data from other SOT languages, would support this conclusion. What about data from non-SOT languages? Could they shed light on whether there are indeed three possible roads to the simultaneous reading in MG?

2.2.2. *Prefer De Se*

There are reasons to posit that a *de re* LF is blocked by the *de se* ones and thus that there are only two roads to the simultaneous reading, both *de se*. Otherwise, our cross-linguistic typology would overgenerate simultaneous readings for non-SOT languages, such as Hebrew and Russian. Indeed, if the embedded past could be read *de re* in MG, yielding simultaneous readings, this would also be predicted to be possible in non-SOT languages. Yet, past-under-past in Hebrew and Russian primarily yield back-shifted instead of simultaneous readings, as seen in the following example from Hebrew, which only conveys the thought ‘Miriam loved me’ (Ogihara & Sharvit 2012):

(41) Lifney alpayim šana, Yosef xašav še Miriam ahava oto
Before 2.000 years, Yosef think-PST that Miriam love-PST him
‘2,000 years ago, Yosef thought that Miriam had loved (literally: loved) him’

Our consultant also had the same intuition about back-shifted readings:

(42) Be šnat alpa'im, Yosef yada še Miriam haita be-heraion
In year 2000, Yosef know-PST that Miriam be-PST pregnant
‘In 2000, Yosef knew that Miriam had been (literally: was) pregnant’

This means that Miriam had been pregnant at some time before 2000, and that what Yosef knew is ‘Miriam was pregnant’. In other words, the embedded past is interpreted *de se*, not *de re*, i.e., the pregnancy is in the

past from the point of view of the attitude holder, Yosef in this case. The same was true for one of our consultants in Russian¹⁹:

(43) *V dvuxtysjačnom godu Ivan znal, čto Maša byla beremenna.*
In 2000 year Ivan know-PST that Masha be-PST pregnant
'In 2000, Ivan knew that Masha had been (literally: was) pregnant'

Why do speakers of non-SOT languages disprefer a *de re* simultaneous reading of the embedded past? In other words, why do we get disjoint reference effects in Hebrew and in Russian, namely that the embedded past is preferably *de se*? This observed competition between a *de se* present- and a *de re* past-under-past to derive the simultaneous reading could be the result of *Prefer De Se*, a rule stating that a *de se* LF is preferred over a *de re* one when they yield similar truth conditions²⁰. Such a rule is also used to explain disjoint reference effects triggered by logophoric pronouns²¹ (Schlenker 1999).

We will therefore assume that the preferred LFs are (39) and (40), the latter being obtained by the SOT rule. (38) is blocked by an independently motivated (Schlenker 1999) *Prefer De Se* rule (reformulated from Ogihara & Sharvit 2012):

Prefer De Se: *A de se LF is preferred over a de re one whenever both are true.*

Definition 2: Prefer De Se rule (to be revised)

Ogihara & Sharvit (2012) use this strategy to explain the unavailability of simultaneous readings of past-under-past in Hebrew. Since the embedded present gives a *de se* LF, while the embedded past doesn't in Hebrew, *Prefer De Se* would explain why **Error! Reference source not found.** only has the back-shifted reading²².

Does that rule apply universally? No, there are cases, where a *de re* LF may be preferred over a *de se* one, namely when the latter is false, and the former is true. This explains why the rule applies when the *de se* and the *de re* LF 'yield practically indistinguishable truth conditions'. More concretely, *de se* truth conditions are a strict subset of *de re* ones. In other words, *de se* LFs are true in fewer cases than *de re* ones. Therefore, there are scenarios in which only a *de re* LF yields the correct truth conditions. In such cases, the *Prefer De Se* rule will not apply. We only prefer a *de se* LF if it can be uttered truly. For example, consider the following context:

We are on Friday, but Mark falsely believes it's Sunday. He says: 'On Friday, it was raining'.

Now consider the following attitude report:

(44) Mark said that it was raining on Friday.

¹⁹ Although there is some within-speaker variation and overall more ambiguity than there was in Hebrew. We will discuss this more in depth in the next chapter.

²⁰ In other words, when you can express *de se* truth conditions, you prefer to do so. We could at first sight give an implicature account of this, yet in such a case the effect would be predicted to disappear under negation which is not the case, nor with logophoric pronouns (Schlenker 1999).

²¹ In 'John hopes he^{de-re} will be elected' for example the logophoric 'he' needs to be disjoint from John.

²² Ogihara & Sharvit (2012) say that 'an LF where a tense is bound from Comp is preferred over a *de re* LF, whenever the two yield practically indistinguishable interpretations. This explains why, out-of-the-blue, for many Hebrew speakers a *de re* interpretation of past- under-past is unacceptable'.

In this case, a *de se* reading would predict that Mark's utterance were 'Today, it is raining'. Yet, this is clearly wrong in this context. A *de re* LF, however, would predict the correct report. Therefore, whenever *de re* LFs are the only ones, *Prefer De Se* does not make its effects felt.

2.2.3. Predicted Logical Forms

In this way, *de re* LFs are dispreferred for simultaneous readings, *de se* LFs being the most available ones (except if the only true LF is a *de re* one, in cases in which the attitude holder is wrong about the time for example). Thus, there are two roads to a *de se* LF in MG: either a shifted present as in (24)(23) or a deleted past as in (25). Both are preferred over a *de re* LF, because of *Prefer De Se*. Therefore, not only is the fact that MG has two rather than roads to the simultaneous reading explained, but also the preference for a shiftable present in non-SOT languages. Our prediction for (25) is that we can choose between the following *de se* LFs, since *Prefer De Se* has blocked a *de re* past-under-past one:

(45) *de se* past-under-past, simultaneous reading:

[A week ago] $\lambda t1$ George say^{past}_t1 $\lambda t0^{past}$ he will^{past}_t0 say_ $\lambda t0^{past}$ they meet^{past}_t0 for the last time.

(46) *de se* present-under-past, simultaneous reading:

[A week ago] $\lambda t1$ George say^{past}_t1 $\lambda t0$ he will_t0 say_ $\lambda t0$ they meet^{pres}_t0 for the last time.

Compare with the English LF of the same sentence with past-under-past, where there is only one option (if we rule out the *de re* past due to *Prefer De Se*), namely tense deletion:

(47)[In 1960] $\lambda t1$ John think^{past}_t1 $\lambda t0^{past}$ that Mary be^{past}_t0 beautiful

Here's the Hebrew counterpart of English (7) from Sharvit (2003):

(48) Lifney šavua, Dan hexlit še be'od asara yamim, bizman aruxat ha-boker,
Before week Dan decide-PST that in ten days at-time food the-morning
 hu yomar le-imo še hu mitga'agea ele-ha.
he will-tell to-his-mother that he miss-PRS to-her

'Dan decided a week ago that in ten days at breakfast he would say to his mother that he missed (literally: misses) her'

A *de re* past-under-past LF is blocked by *Prefer De Se* and we thus predict the correct *de se* LF:

(49)[Before one week] $\lambda t1$ Dan decide^{past}_t1 $\lambda t0$ he will_t0 say_ $\lambda t0$ he miss^{pres}_t0 her.

To sum up, the preference for a shifted present tense over a *de re* in non-SOT languages is derived thanks to a *Prefer De se* rule (which we will revise later in light of new data). The latter also explains the availability of two rather than three roads to a simultaneous reading in MG. Presumably there are two ways to get a *de se* LF in MG: either a shifted present tense or a deleted past. One of the two would be preferred over a *de re* LF, if they yield indistinguishable truth conditions. We note that this is a preliminary analysis, which we will revise in the next Chapter in light of new empirical generalizations.

2.3. Summary

In this chapter, we established that MG has two roads to the simultaneous reading. Both present- and past-under-past are acceptable to convey the simultaneous reading in an attitudinal environment, because of the co-existence of two independent parameters in MG: (i) a deleted past and (ii) a shiftable present. The latter does not shift in non-attitudinal environments, like relative clauses, thus behaving like Russian present tense.

Thus, MG has a mixed tense system, having the deleted past of English and French, as well as the shiftable present of Russian and Hebrew.

We claimed that based on MG, there could in principle be three roads to the simultaneous reading: (i) a deleted past, (ii) a *de re* past and (iii) a shifted present. Yet, cross-linguistic data from non-SOT languages, which disprefer strategy (ii), led us to adopt a *Prefer De Se* rule. Thus, we finally claimed that MG only has two roads to the simultaneous reading, namely a deleted past and a shifted present.

3. Chapter 3: Simultaneous readings cross-linguistically

In this chapter, we will focus on past-under-past sentences in non-SOT languages. As we saw in chapter 2, the claim in the literature is that in such sentences there is a preference for back-shifted readings in non-SOT languages, which is what motivated the *Prefer De Se* rule in our analysis. However, as mentioned in Ogihara & Sharvit (2012), simultaneous readings of past-under-past seem to be accessible at least for some Hebrew speakers. We will see that such readings are even more accessible in Russian, to the extent that past-under-past sentences can be perceived as ambiguous between a simultaneous and a back-shifted reading. In our work with consultants²³, we aimed to answer two questions for the non-SOT languages Russian, Hebrew and Farsi:

- a. Are simple past-under-past sentences ambiguous between a simultaneous and a back-shifted reading?
- b. Whenever there was ambiguity, this raised the question whether the relevant language was genuinely a non-SOT language. So, we tested Kamp & Rohrer (1983) and Abusch (1994; 1997) examples, where the *de re* LF is false. The question we asked was: is a simultaneous reading accessible in this case?

The first question aims to determine the extent to which *de re* LFs of the embedded past are accessible. The second, aims to determine whether there is an SOT rule. Through this empirical work, we will see that the availability of simultaneous readings of past-under-past varies across speakers and across non-SOT languages.

3.1. Russian

The claim in the literature is usually that in Russian past-under-past sentences, back-shifted readings are salient, while simultaneous ones are marked (Grønn & Stechow (2010), Altshuler (2016) a.o.). However, there have been authors, such as Vostrikova (2018), who consider them ambiguous between a back-shifted and a simultaneous reading.

We tested the following past-under-past sentence:

(50)V dvuxťysjačnom godu Ivan znal, čto Maša byla beremenna.
In 2000 year Ivan know-PST that Masha be-PST pregnant
'In 2000, Ivan knew that Masha was/had been pregnant'

For 3 out of 4 consultants the sentence was ambiguous between a simultaneous and a back-shifted reading. In other words, there were two possible, equally probable, answers to the question 'What did Ivan know?':

- a. 'Masha is pregnant' (in 2000)
- b. 'Masha was pregnant' (at some time before 2000)

For one of our consultants, however, even though both readings were accessible, the back-shifted reading was more salient, in accordance with what has been claimed in the literature. It thus seems that past-under-past sentences in Russian have two readings and that there's within-speaker variation with respect to whether the back-shifted reading is preferred. Therefore, the following generalization reveals itself:

²³ The data we will present come from the following consultants, who very kindly devoted their time: Alexey Koshevoy, Lena Pasalskaya, Petr Kusily and Ekaterina Vostrikova for Russian, Nur Lan for Hebrew, Amir Anvari for Farsi. The main reason we chose linguists to be our consultants is that these are hard judgments and we wanted to make sure that the targeted readings were understood. We note that this is standard practice in the field and that Sprouse et al. (2017) showed that this is a reliable method.

Past-under-past sentences in Russian can have both the simultaneous and the back-shifted readings. For most speakers, these sentences are ambiguous, while for others there is a preference for the back-shifted reading.

Generalization 1: Past-under-past in Russian

The observation that past-under-past sentences in Russian are genuinely ambiguous, goes against the prediction of our *Prefer De Se* analysis and bridges the gap between Russian and MG. Indeed, given that the Russian present tense also shifts in attitude reports, it seems that in simple past-under-past cases, there is optionality in Russian too. In other words, both the present- and the past-under-past may be used to express a simultaneous reading.

Nevertheless, there are two differences with MG. Firstly, while for some Russian speakers the back-shifted reading is more salient and for others the two readings are equally accessible, for none of our consultants was the simultaneous reading more accessible than the back-shifted reading, as is the case in MG. Secondly, in Russian there is within-speaker variation with respect to the extent to which the back-shifted reading is preferred; such variation is not observed in MG.²⁴

In any case, *Generalization 1* tightens the gaps between non-SOT and mixed tense languages, raising the following question: is Russian really a non-SOT language, or does it also have a deletion rule like MG? To see this, we ran the familiar by now diagnostic, where a past-under-past sentence can only have a simultaneous reading if there is a deletion rule. This is the Abusch (1994; 1997) example adapted by Kamp & Rohrer (1983), where the *de re* LF yields a false reading. Thus, since only *de se* LFs are accessible, the embedded past is either interpreted yielding a back-shifted reading or deleted (assuming there is an SOT rule) yielding a simultaneous reading. We replicated a version of the Abusch-example in Russian:

(51) Nedelju nazad, Ivan skazal, što čerez 10 dnej on skažet svoej devuške
Week back, Ivan say-PST that across 10 days he say-FUT his girlfriend,
što oni vstretilis' v poslednij raz.
that they meet-PST-PFV in last time.

'A week ago, Ivan said that in 10 days he would say to his girlfriend that they met/have met for the last time'

Here, judgments diverged. Two of our consultants only reported the back-shifted reading. This is the reading, according to which Ivan calls his girlfriend and tells her 'We met for the last time'. Crucially, the simultaneous reading was not accessible for them, indicating that there is no SOT rule in Russian indeed. Nevertheless, the other two consultants could also access a simultaneous reading (as well as the back-shifted one). This is the reading, according to which in three days from now Ivan meets his girlfriend and tells her 'We are meeting for the last time'. This is very puzzling, since it seems to indicate that there is an SOT rule in Russian, unlike what has been described in the typology so far.

One possible explanation of this divergence in judgments could be that there are two dialects of Russian, one where there is an SOT rule and one where there is no such rule. In any case, these are directions for future

²⁴ As our experimental results showed (see section 2.1.2), there was a significant effect of tense, meaning that past-under-past was preferred over present-under-past to express the simultaneous reading. Of course, for a proper comparison to be made the experiment would have to be replicated in Russian, but based on consultant work, the opposite pattern is observed in Russian, i.e., present-under-past is the default way to express a simultaneous reading.

research. Possibly, a large-scale collection of judgments would be needed to settle this issue. We will not delve deeper into the question of whether Russian is an SOT or a non-SOT language into this thesis, but we will leave this open for future research.

In any case, even if Russian turns out to have an SOT rule after all, there is still a difference with MG, since the preferred strategy to get the simultaneous reading in Russian is with an embedded present, while no such preference exists with MG. Indeed, the embedded present would be the most natural way to express the simultaneous reading in Russian:

- (52) Nedelju nazad, Ivan skazal, čto čerez 10 dnej on skažet svoej devuške,
Week back, Ivan say-PST that across 10 days he say-FUT his girlfriend,
čto oni vstrečajutsja v poslednij raz.
that they meet-PRS in last time.
'A week ago, Ivan said that in 10 days he would say to his girlfriend that they met (literally: meet) for the last time'

3.2. Hebrew

The simultaneous reading in Hebrew is also by default obtained via a shifted present. The claim for past-under-past sentences is that although both readings are accessible for some (but not all) speakers, the back-shifted reading is more salient. Interestingly, Ogihara & Sharvit (2012) note that the simultaneous reading can be made more salient for some speakers with the use of 'az' ('then'):

- (53) Lifney alpayim šana, Yosef xašav še Miriam ahava oto (az)
Before 2.000 years, Yosef think-PST that Miriam love-PST him (then)
'2,000 years ago, Yosef thought that Miriam loved him then'

However, this was not the case for our consultant, for whom past-under-past sentences had a more salient back-shifted reading (with 'az' too). We leave this aside for now, since we will discuss the role of the temporal adverbial 'then' later on in the thesis. What is important is that the simultaneous reading with past-under-past is possible. Now, the question that arises is: are past-under-past sentences (without 'az') genuinely ambiguous like in Russian or is there a preference for the back-shifted reading?

Here is the example with tested:

- (54) Be šnat alpayim, Yosef yada še Miriam haita be-heraion
In year 2000, Yosef know-PST that Miriam be-PST pregnant
'In 2000, Yosef knew that Miriam had been pregnant'

Our consultant reported the back-shifted reading, according to which what Yosef knew is 'Miriam was pregnant' (at some salient time before 2000). Therefore, based on Ogihara & Sharvit (2012) and our consultant's intuitions, the following generalization seems to hold for Hebrew:

Past-under-past sentences can have both the simultaneous and the back-shifted reading, but the latter is the more salient one.

Generalization 2: Past-under-past in Hebrew

Thus, Hebrew behaves as expected based on our *Prefer De Se* analysis, since the *de se* back-shifted LF is preferred over the *de re* simultaneous one. Now, what about critical examples, where no simultaneous reading is predicted to arise? Consider the following:

(55) Lifney šavua, Yosef amar še be'od asara yamim hu yagid le
Before week, Yosef say-PST that in ten days he say-FUT to
 xavera šelo še hem nifgešu ba pa'am ha'axrona.
girlfriend his that they meet-PST for last time.
 'A week ago, Yosef said that in ten days he would say to his girlfriend that they have met for the last time'

Our consultant reported that this sentence only has the back-shifted reading, according to which Yosef will say via the phone 'We met for the last time'. Crucially, the simultaneous reading isn't accessible, which confirms that Hebrew does not have an SOT rule. Therefore, to the extent that simultaneous readings of past-under-past sentences are accessible, they must be generated from *de re* LFs.

3.3. Farsi

Does Farsi behave like Russian or like Hebrew? Judgments diverge. According to our consultant, past-under-past sentences have a more salient back-shifted reading²⁵:

(56) saale 2000, Abtin midunest ke Nadia hamele bud
year 2000, Abtin knew-3sg that Nadia pregnant was-3sg
 'In 2000, Abtin knew that Nadia had been pregnant'

However, Sameri & Karimi-Doostan (2019) argue based on data from 32 native speakers that past-under-past sentences can have a simultaneous reading, the latter being expressible either with a present- or with a past-under-past. Even though their use of the adverbial 'then' (*hæmun moq'e*) in many examples may have biased speakers in the 'fill in the blanks' task to use the past tense (as we will see in Chapter 4 'then' is often incompatible with a shifted present), the fact that in open-ended questions 90% of the participants mentioned that past-under-past *can* have the simultaneous reading, indicates that at the very least it is accessible. Nevertheless, when transforming direct into indirect speech, there was a clear preference for the shifted present, since all participants used this strategy in their reports. Since Sameri & Karimi-Doostan's (2019) study only targeted simultaneous readings, we do not know if in comparing past-under-past sentences alone (without the use of the adverbial 'then'), there would be ambiguity or a preference for the back-shifted reading, as for our consultant. Therefore, we cannot yet place Farsi in the Russian-type of a non-SOT language or in the Hebrew one. What we can, however, conclude is the simultaneous reading of past-under-past is available. Whether it is as available as the back-shifted one or less so is left open for future research.

Is Farsi really a non-SOT language or is rather a mixed tense one, like MG? Complex examples, where the *de re* interpretation of the embedded past is blocked will reveal the answer. Indeed, the following only has the back-shifted reading in Farsi for our consultant:

(57) hafteie pish, Abtin goft ke dah ruz dige be dustdoxtar-esh
week previous, Abtin tell-PST that ten day otherto girlfriend-his
 xaahad goft ke da'f'ie axari-bud ke hamdigaro didan
will tell-PST that time last-was that eachother see-PST

²⁵ We should note that the simple past is generally a bit odd for Amir, but to the extent that judgments are accessible the sentence has a clearly back-shifted reading.

‘A week ago, Abtin said that in ten days he would say to his girlfriend that they had met for the last time’

On the contrary, when the shifted present is used, the simultaneous reading arises:

(58) *hafteie pish, Abtin goft ke dah ruz dige be dustdoxtar-esh*
week previous, Abtin tell-PST that ten day otherto girlfriend-his
xaahad goft ke da’f’ie axari-e ke hamdigaro mibinan
will tell-PST that time last-is that eachother see-PRS
 ‘A week ago, Abtin said that in ten days he would say to his girlfriend that they met for the last time’

Sameri & Karimi-Doostan (2019) also confirm this. The following can only have the back-shifted reading:

(59) *hæfteye piš, ʔæli fekr kærd ke 10 ruz ʔayænde be maman-eš xah-æd*
week ago, Ali think do-PST that 10 day next to mother-his will-3SG
goft ke del-eš bæraš tæng šod-e bud.
say-PST that heart-his for-her small become-PSP be-PST.
 ‘Ali thought a week ago that in 10 days he would tell his mother that he had missed her.’

If the shifted present is used instead of the most embedded past tense, then the sentence has the simultaneous reading. Therefore, Farsi does not have an SOT rule since the embedded present in these examples unambiguously has the back-shifted reading. At this point, we should mention that even though Sameri & Karimi-Doostan (2019) make a comparison between MG and Farsi, on the basis of optionality between a shifted present and an embedded past to convey the simultaneous reading, Farsi is not a mixed tense language. Examples (58) and (59) demonstrate that it is a clear non-SOT language. Simultaneous readings of past-under-past are therefore accounted for by *de re* readings of the embedded past.

3.4. Summary of findings

To sum up, we have seen that non-SOT languages, differ to the extent to which they allow for simultaneous readings of past-under-past sentences. In Russian there seems to be genuine ambiguity, in Hebrew the back-shifted reading is preferred, while the simultaneous one is still possible²⁶. As we mentioned, further research would be needed to clarify whether Farsi is a Russian- or a Hebrew-type non-SOT language. Our main findings are summarized in the following table:

Table 3: Main findings on non-SOT simultaneous readings

Language:	Russian	Hebrew
Past-under-past:	Ambiguous for most	Back-shifted more salient
SOT example:	2 out of 4 accept a simultaneous reading	Only back-shifted

²⁶ In Ogihara’s (2007) Japanese a past-under-past sentence only has the back-shifted reading, even though he reports some cases of past-under-past where the simultaneous reading is available (for other Japanese speakers). Yasu Sudo (p.c.), however, considers past-under-past sentences generally ambiguous in Japanese, such as:

(i) *ninenn mae, Yusuke-wa Yukiko-ga ninshinn shiteita to shitteita.*
2-years before Yusuke-top Yukiko-nom pregnant be-PST comp know-PST
 ‘2 years ago, Yusuke knew that Yukiko was/had been pregnant’

Two kinds of variation with respect to the availability of simultaneous readings is observed in non-SOT languages:²⁷

- a. Across-language variation
- b. Within-speaker variation

3.5. Rethinking *Prefer De Se*

In our previous analysis (see Chapter 2), we had used a *Prefer De Se* LFs pragmatic rule to explain the fact that back-shifted readings of past-under-past are preferred in non-SOT languages. The reasoning was the following: past-under-past sentences in non-SOT languages may either have a *de re* LF giving rise to a simultaneous reading (since the embedded past is interpreted with respect to the time of the utterance) or a *de se* one giving rise to the back-shifted reading (since the embedded past is interpreted with respect to the 'now' of the attitude holder). The *Prefer De Se* rule accounted for the preference of the latter, which in turn explained the preference for back-shifted readings in non-SOT languages.

However, our empirical investigation of non-SOT languages put into question this preference for back-shifted readings, at least for Russian as well as for some non-SOT speakers of Hebrew and Farsi. Now, the problem is the following: if *Prefer De Se* is a pragmatic rule, then it is expected to operate uniformly across languages and speakers. How can we account for the two-fold variation in the accessibility of simultaneous readings of past-under-past in speakers of non-SOT languages?

From a theoretical perspective, there are two possible strategies to solve this problem:

- (i) either we would have to say that *Prefer De Se* is a semantic rather than a pragmatic²⁸ rule and is thus parametrized across languages and/or speakers
- (ii) or we would have to slightly modify *Prefer De Se* and introduce a syntactic *Prefer Local Binding* rule, which is parametrized and thus accounts for the cross-linguistic and within-speaker variation.

The first strategy is straightforward, but rather counter-intuitive since the behavior of *Prefer De Se* is reminiscent of a pragmatic or cognitive constraint observed in other domains too. For example, in an out of the blue context, the most intuitive reading of the following sentence, assuming the embedded pronoun refers to Rosa, is one in which the pronoun refers to Rosa *de se*, i.e., the sentence is most naturally interpreted as reporting a first personal attitude of Rosa's, 'I am smart':

(60) Rosa believes that she is smart.

What is more, the fact that *Prefer De Se* is a rather 'soft' principle, not operating in case of mistaken belief or in case there is a disambiguating context,²⁹ suggests that its nature is pragmatic/cognitive. Nevertheless,

²⁷ One direction for future research, given that within-speaker variation is observed, would be to collect judgments in a large-scale experiment. This would allow to answer the following question: are there indeed three types of non-SOT languages or are there three types of non-SOT speakers? In other words, is it the case that the preference for *de se* readings varies across-languages or does it simply vary across dialects in each language?

²⁸ We presuppose that pragmatic principles are universal.

²⁹ The example we just gave could be made true in the following scenarios:

- (i) Rosa has heard how smart Mary is, but has never met her in real life yet. Rosa's belief is 'Mary is smart', yet she is unaware that the woman in front of her *is* indeed Mary. In this context, we can utter (60), without preferring a bound reading of the pronoun 'she'.

given that all our arguments in favor of the pragmatic/cognitive nature of *Prefer De Se* are theory-internal so far, we will not dismiss strategy (i). Since it would correctly predict our data, we consider it to be a theoretical possibility.

We will now focus on strategy (ii) to explain the variation across non-SOT languages. This solution has two steps: first, we will reformulate *Prefer De Se* in terms of a preference for *de se* readings rather than for *de se* LFs; then, we will introduce a new constraint on local binding, which will be parametrized, predicting the typological variation.

3.5.1. Reformulating *Prefer De Se*

Our previous formulation of *Prefer De Se* was in terms of LFs. More specifically, the rule was ‘A *de se* LF is preferred over a *de re* one whenever both are true’. However, we should note that a distinction can be drawn between a *de se* LF and a *de se* reading. Crucially, not all *de se* readings arise from *de se* LFs. In other words, depending on the implementation of *de re* that we adopt, a *de re* LF may give rise to a *de se* reading.

We could choose to interpret *de re* LFs existentially (Kaplan 1986; 2013 a.o.), as quantifying over implicit temporal descriptions.³⁰ In other words, a sentence like ‘John thought that Mary was pregnant’ would be equivalent to ‘there is a temporal description *d* for time *t* such that John believed that Mary was pregnant at the time *d*’. However, if we adopt this view of *de re*, since descriptions are existentially quantified over in the semantics of the sentence, we do not know which description is actually the one that makes the sentence true, and in particular we do not know whether this description is *de se* or not.³¹ Therefore, in a system where the temporal description is quantified over at the level of meaning, we would not be able to obtain *de se* readings of *de re* LFs. Thus, a *Prefer De Se* readings rule would still rule out all simultaneous readings in non-SOT languages. Therefore, we would find ourselves with the same problem that the previous analysis faced.

For this reason, we will adopt a view of *de re*, where the temporal description is not quantifier over at the LF but is rather contextually provided via the assignment function (see Heim (1994), Cresswell & von Stechow (1982) a.o.). More concretely, a sentence like ‘John believed that Mary was pregnant’ would be equivalent to ‘John believed that Mary was pregnant at the time *d*, where *d* is the description assigned to *t* by the assignment function’. In this way, *de re* LFs can give rise to *de se* readings, namely if the assignment function happens to assign to *t* the temporal description that the attitude holder actually had. In other words, in this system *de re* LFs can be further specified to achieve *de se* truth conditions, if an implicit temporal description provided contextually in a *de re* LF happens to be *de se*.

Now, we modify the *Prefer De Se* rule to refer to *de se* readings instead of *de se* LFs, as follows:

Prefer *de se* readings whenever they are true

Definition 3: Prefer De Se (revised)

-
- (ii) Rosa is at a conference about the artist Marina Abramović. She is an art lover and thinks that Marina is an art genius. Rosa’s belief is ‘Marina is smart’. In this context, where there is a salient contextual referent for the pronoun, there is again no preference for a bound reading of ‘she’.

³⁰ These temporal descriptions would be functions from world-time pairs to times (see Heim, 1994). In other words, they are descriptions through which an attitude holder represents a time to themselves. For example, the ‘now’ of the attitude holder would be a function mapping each $\langle w, t \rangle$ to *t*.

³¹ Unless there is only one possible description of *t* in the first place. But we abstract over this rather specific and implausible scenario.

Since both a *de se* and a *de re* LF may have a *de se* reading, adopting a *Prefer De Se* readings (rather than LFs) rule no longer rules out the *de re* reading of past-under-past in non-SOT languages. The revised version of *Prefer De Se* describes a pragmatic or cognitive preference for *de se* readings; it is not important how these readings are obtained (i.e., via a structurally *de re* or *de se* LF).

How many roads are there to a *de se* reading of a past-under-past sentence in a given language? If a language has an SOT rule, then there are three roads to a *de se* reading:

- (i) A *de re* LF with a *de se* temporal description (simultaneous interpretation)
- (ii) A *de se* LF with a deleted past (simultaneous interpretation)
- (iii) A *de se* LF with an interpreted past (back-shifted interpretation)

In non-SOT languages, where there is no tense deletion rule, we only have two ways to the *de se* reading of past-under-past, namely (i) and (iii). Therefore, past-under-past sentences are in principle ambiguous in both SOT and non-SOT languages. The effect of *Prefer De Se* is very subtle – it makes sure that the attitude holder’s temporal description is preferred over a contextually provided one.

3.5.2. *Prefer Local Binding*

Given the revised *Prefer De Se* rule, we now predict the ambiguity observed in Russian as well as the fact that simultaneous readings are accessible for some non-SOT speakers in general. Yet, we now have the opposite problem: we do not predict the preference for a back-shifted reading observed in Hebrew as well as for other non-SOT speakers.

To solve this problem, accounting for the typology as well as for all kinds of non-SOT speakers, we introduce a grammatical parametrization rule, *Prefer Local Binding*, referring to the syntactic structure of the LF:

Let S and S' be two LFs such that they only differ in a temporal variable being bound locally in S and being provided contextually in S' . If S and S' have the same meaning, S' is ungrammatical.

Definition 4: Prefer Local Binding

This rule falls under a more general *Prefer Local Binding* principle, which has been argued to operate in the pronominal domain. Related principles are Condition C and Rule I³² (Reinhart (1983b), Reinhart (2006), Heim (2007)).

Prefer Local Binding is a syntactic principle, that may vary in two ways:

- a. Across languages
- b. Within speakers

What this principle does when relevant, is prioritize structurally *de se* LFs, where the temporal variable is locally bound. In non-SOT languages, the structurally *de se* LF available for the simultaneous reading, i.e. with a shifted present is thus preferred over the *de re* LF of past-under-past. The later ends up having only the back-shifted interpretation. In SOT languages, ambiguity between a simultaneous and a back-shifted reading of past-under-past sentences is predicted.³³

³² Rule I: If coreference and binding are semantically indistinguishable, then use binding instead of coreference.

³³ This ambiguity is indeed attested. However, we do not predict the preference for the simultaneous interpretation that is attested in SOT languages in ‘out of the blue’ contexts. This could be because there is no contextually salient past

3.5.3. The new algorithm

The new algorithm would therefore have two instead of one step. First, we apply the revised *Prefer De Se* rule everywhere. As noted earlier, this makes the prediction that past-under-past is ambiguous across-the-board. There are three roads to a *de se* reading of past-under-past in SOT languages, and two in non-SOT ones.

Secondly, we apply *Prefer Local Binding* in the languages that have this parameter. The effect of this principle is to block structurally *de re* LFs when the same meaning can be expressed with a *de se* LF. This means blocking the only road to a simultaneous reading with past-under-past if the language does not have a deletion rule. Instead, the *de se* LF of present-under-past is preferred to express the simultaneous reading in such a language. Since this would be an unwanted prediction for Russian, we take it to be [- *Prefer Local Binding*] language. On the contrary, Hebrew, at least for some speakers, is [+ *Prefer Local Binding*]. Overall, given that *Prefer Local Binding* may vary within speakers of a non-SOT language, we predict the variation observed in judgments when it comes to non-SOT speakers.³⁴

3.5.4. Novel Predictions

We presented two possible ways we can account for the cross-linguistic picture with respect to simultaneous readings of past-under-past in non-SOT languages. One strategy is to parametrize *Prefer De Se* (LFs), making it a semantic rather than a pragmatic/cognitive rule. Another strategy is to keep the pragmatic/cognitive nature of *Prefer De Se*, but state it as a preference for *de se* readings rather than LFs. On top of that, we would need a *Prefer Local Binding* parameter, which would be active for certain non-SOT languages as well as for certain non-SOT speakers in general.

Given that both theories account for the empirical picture, it would be a theory-internal choice. If we are inclined towards keeping the pragmatic nature of *Prefer De Se* and adding a *Prefer Local Binding* rule, this would only be because the behavior of the former resembles that of other pragmatic principles (e.g., is not always strong, may be omitted in certain contexts). But in terms of predicting the data, the two solutions are equivalent. How can we choose between them? Could we find an empirical prediction that distinguishes between them?

One prediction made by both theories, is that similar typological distinctions or variation with respect to the availability of *de se* readings should be observed with pronouns. In other words, we predict the existence of languages with logophoric pronouns, where their use is optional. These would be the equivalent of Russian in the pronominal domain: just like a *de re* LF for past-under-past may have the same reading as a *de se* LF for present-under-past in Russian, a non-logophoric pronoun could have the same reading as a *de se*, logophoric one. More concretely, there could be synonymy between the equivalent of the following two sentences in such a language:

(61) John says that he is hungry

moment the past could refer to and not due to the grammar. After all, all our examples were ‘out of the blue’ since we gave no context. Further research could clarify this.

³⁴ Note that the correct prediction is also made for complex cases, where a *de re* LF is unavailable. In this case, the rule is vacuous, since the *de re* LF is not available in the first place. What is more, we can correctly predict *de re* readings of past-under-past in cases of mistaken temporal orientation. Indeed, if the *de se* and the *de re* LFs do not have the same meaning, i.e., if the *de se* LF is false because the attitude holder is mistaken in their temporal description, then *Prefer Local Binding* does not apply.

(62) John says that LOG is hungry

Even though this is an interesting prediction, it does not help us distinguish between the two theories. In the first theory, where *Prefer De Se* (LFs) is parametrized, this language would be [- *Prefer De Se*]. In the second theory, where *Prefer Local Binding* is parametrized, this language would be [- *Prefer Local Binding*].

There is, however, another prediction that is only made by the second theory. If *Prefer Local Binding* is parametrized, then it should also be the case for the pronominal domain. This makes the typological prediction that there should be languages without Condition C³⁵. To give an example, consider the following English sentence form Trinh & Truckenbrodt (2018):

(63) *Mary₁ said that Mary₁ would live here

Reinhart (1983) explains this as a Condition C violation. More specifically, Condition C favors a reading where the embedded subject is bound by the matrix one, as in the following:

(64) Mary₁ λ₁ said that she₁ would live here

The parametrization of *Prefer Local Binding* predicts that there should be languages, where (63) is grammatical and there is optionality between (63) and (64). If this prediction turns out to be true, then we have a way of distinguishing between the two theories. More specifically, the parametrization of *Prefer De Se* does not predict what the addition of *Prefer Local Binding* does. Thus, this would be indirect empirical evidence in favor of the second theory. Indeed, this prediction seems to be true. Trinh & Truckenbrodt (2018) describe Vietnamese as a language without Condition C. In Vietnamese, the following are synonymous (i.e., truth-conditionally equivalent):

(65) Minh nói với Linh: “Tao sẽ sống ở đây.”
Minh said to Linh I will live here

(66) Minh nói với Linh: “Minh sẽ sống ở đây.”
Minh said to Linh Minh will live here

Therefore, we will adopt the second theory and conclude that *Prefer De Se* is indeed a rule of a pragmatic or cognitive nature.

3.5.5. Insights from ellipsis

We have argued that *Prefer Local Binding* is active in Hebrew as well as for some non-SOT speakers. What about SOT languages? How can we determine if *Prefer Local Binding* is active in English or MG, for example, where there is an SOT rule?

Given that a structurally *de se* LF can have the simultaneous reading thanks to the SOT rule, the availability of such a reading in SOT languages is not informative as to whether the *de re* LF with a *de se* temporal description is also available. More specifically, in MG, there could in principle be three ways to obtain a simultaneous reading:

- a. A present-under-past sentence with a *de se* LF

³⁵ We also make the prediction that there should be languages without Condition B (i.e., ‘a pronoun cannot have a c-commanding antecedent’). For example:

- (i) Ann said that she hates her

In English we get a disjoint reference effect, namely that ‘she’ refers to an individual different than ‘her’. We predict the existence of language without such an effect. In other words, a language without Condition B.

- b. A past-under-past sentence with a *de se* LF, with a deleted past
- c. A past-under-past sentence with a *de re* LF, which has a *de se* temporal description

How can we determine whether all three roads to the simultaneous reading are available in MG? Equivalently, how can we know whether English has both (b) and (c) or only (b)?

To answer these questions, we propose to look at data from ellipsis. If there is a *de re* road, namely (c), to the simultaneous reading as well, we expect ambiguity under ellipsis with past-under-past. This is because both (b) or (c) could in principle be copied in the elided material. If, however, there is only a *de se* road, namely (b), we expect no ambiguity. Consider the following example in MG, which we tested with two consultants:

Context: There are press conferences every day for the evolving pandemic situation.

(67) Chtes i omilitria iche tin entiposi oti kani /ekane
 Yesterday the spokesperson have-PST the impression that make-PRS/-PST
 ena lathos. Simera ephis.
 a mistake. Today too.

'Yesterday the spokesperson had the impression that she is making/was making a mistake. Today too.'

The use of the embedded present gives rise to an unambiguous reading as expected since only a *de se* LF is available to be copied. More specifically, it means that the spokesperson is making a mistake again today, thus having made two mistakes in total. On the contrary, the use of the embedded past is ambiguous:

- (i) It could have the same meaning as the embedded present, giving rise to the inference that the spokesperson made two mistakes, one yesterday and one today. In this case the *de se* LF is copied.
- (ii) It could also have another meaning, namely that today she has again the impression of having made a mistake yesterday, thus having made only one mistake in total. In this case the *de re* LF of the embedded past is copied.

Given that (ii) is available with past-under-past, we conclude that (c) is an available strategy to obtain the simultaneous reading. Therefore, contrary to what we had argued for in Chapter 2, MG has three roads to the simultaneous reading. This also means that MG, like Russian, is [- *Prefer Local Binding*]³⁶. Hopefully, future research will reveal how the rest of SOT languages behave in this matter. The prediction would be that some SOT languages behave like MG, while others do not, having a non-ambiguous elided past-under-past.

3.6. Summary

In this chapter we empirically investigated the availability of simultaneous readings in non-SOT languages, concluding that there is across-languages as well as within-speaker variation. For example, while past-under-past is ambiguous in Russian, it usually has a back-shifted reading in Hebrew. These findings question our previous account, which aimed to explain the back-shifted readings of past-under-past in non-SOT languages. Thus, we reformulated *Prefer De Se* in terms of preferring *de se* readings rather than LFs, and we introduced a *Prefer Local Binding* parametrization. This new, revised analysis predicts more typological variation, as it can make distinctions between non-SOT languages too (Russian vs. Hebrew). Finally, we provided data from ellipsis, arguing that contrary to our previous analysis there are three and not two roads to the simultaneous reading in MG.

³⁶ And would be [- *Prefer De Se*], had we maintained the theory according to which *Prefer De Se* (LFs) is parametrized.

4. Chapter 4: The ‘then’-present puzzle

After having discussed SOT phenomena and the accessibility of simultaneous readings in non-SOT languages, we will focus on the interaction of shifted present and the adverbial ‘then’ cross-linguistically. In this chapter, we will build on observations from Ogihara & Sharvit (2012) and Vostrikova (2018), who have observed that ‘then’ is incompatible with the shifted present. We are going to provide novel data, establishing that ‘then’ is incompatible with a shifted present cross-linguistically (except for Japanese possibly). We will refer to this as the ‘*then*’-present puzzle.

4.1. Main empirical generalizations

The two main empirical generalizations are that ‘then’ is incompatible with the present tense in (i) matrix and (ii) embedded contexts. Regarding the latter, we will show that it holds for a present tense shifted under a past tense attitude verb in languages with a shifted present, as well as for a present tense shifted under ‘will’ in both SOT and non-SOT languages.

4.1.1. Incompatibility with matrix present tense

In general, it is the case that ‘then’ is cross-linguistically incompatible with a matrix present tense morpheme:

(68)*John is then not feeling well.

(69)*O Yanis dhen niothi kala tote
The Yanis not feel-PRS well then

MG

Intended: ‘Yanis is not feeling well (now)’

(70)*On izučaet matematiku togda
He study-PRS math then

Vostrikova (2018)

Intended: ‘He studies math (now).’

This is expected, since ‘then’ intuitively conveys a time other than the time of the utterance. What is unexpected, however, is that ‘then’ is incompatible with the present tense in attitude reports (Vostrikova, 2018). We will call this the ‘*then*’-present puzzle.

4.1.2. Incompatibility with the shifted present

Incompatibility between ‘then’ and a shifted present is unexpected, since the latter *does* convey a moment other than the utterance time and should thus in principle be compatible with ‘then’. To see whether ‘then’ was compatible with the shifted present, we tested it in the following environments:

- a. Under a past tense attitude verb in languages that have a shifted present, i.e., in non-SOT languages as well as in MG
- b. Under the modally-interpreted ‘will’³⁷ in both attitudinal and relative clause environments

³⁷ Abusch (1998) analyzes ‘will’ as a modal operator, being able to shift the local now. Therefore, even in languages with a purely indexical present, such as English, present-under-future sentences are possible.

Russian

We replicated Vostrikova's (2018) observation for Russian, namely that 'then' is incompatible with a shifted present with our two consultants³⁸:

- (71) V dvux tysjačnom godu Ivan znal, čto (*togda) Maša beremenna.
In 2000 year Ivan know-PST that (*then) Maša pregnant
'In 2000, Ivan knew that Mary was (literally: is) pregnant (*then)'

What is more, we extend Vostrikova's observation to cases of present-under-future in both attitudinal and relative clause environments. The latter are important, because they give us a clue as to the nature of the phenomenon: the 'then'-present puzzle is not restricted to attitudinal environments. Thus, it most probably does not have to do with the semantics of attitude verbs, but with those of the shifted present. 'Then' is incompatible with a shifted present, be it shifted by an attitude verb or simply by 'will', as the following data indicate:

- (72) V 2030, Ivan skažet, čto on (*togda) sidit v tjur'me.
In 2030, Ivan say-FUT, that he (*then) sit-IMPFV in jail
'In 2030, Ivan will say that he is in jail (*then)'
- (73) V 2030 godu, Ivan budet ženat na tom, kto (*togda) sidit v tjur'me.
In 2030 year, Ivan be-FUT marry-PFV-PASS to someone, who (*then) sit-IMPFV in jail
'In 2030, Ivan will be married to someone who is (*then) in jail'

Therefore, it seems that 'togda' in Russian is incompatible with the shifted present, not only under past tense attitude verbs as has been described (Vostrikova, 2018), but also under future tense. Crucially, these examples all become grammatical once 'togda' is removed.

Hebrew

Ogihara & Sharvit (2012) report that 'az' in Hebrew is incompatible with shifted present, providing the following example:

- (74) Lifney alpayim šana, Yosef xašav še Miriam ohevet oto (*az)
Before 2,000 year, Yosef think-PST that Miriam love-PRS him (*then)
'2,000 years ago, Yosef thought that Miriam loved (literally: loves) him (*then)'

Indeed, according to our consultant³⁹, this is the case:

- (75) Be šnat alpa'im, Yosef yada še Miriam (*az) be-heraion
In year 2000, Yosef know-PST that Miriam (*then) pregnant
'In 2000, Yosef knew that Miriam was (literally: is) pregnant (*then)'

Again, we extend this paradigm to present shifted under future:

- (76) Be 2030, John yagid še hu (?az) ba kele (*az)
In 2030, John say-FUT that he (?then) in jail (*then)
'In 2030, John will say that he is (?then) in jail (*then)'

³⁸ We thank Alexey Kochevoy and Lena Pasalskaya, who kindly devoted their time.

³⁹ Once again, we thank Nur Lan for having devoted his time.

We see here that the position of ‘then’ matters, yet in any case ‘then’ deteriorates the judgment. The same holds for present shifted under future in a relative clause:

- (77) Be 2030, John yihíe nasui le miši še (*az) ba kele
*In 2030, John be-FUT married to someone-fem that (*then) in jail*
‘In 2030, John will be married to someone who is in jail (*then)’

Therefore, in Hebrew, too, ‘az’ is incompatible with a shifted present.

Modern Greek

MG is no exception to this paradigm. The MG data show that the incompatibility of ‘then’ with shifted present is not specific to non-SOT languages, as it also holds for mixed tense ones:

- (78) To 2000, o Yanis iksero oti i Maria ine egkios (*tote)
*The 2000, the Yanis know-PST that the Maria be-PRS pregnant (*then)*
‘In 2000, Yanis knew that Maria was (literally: is) pregnant (*then)’

We can replicate the future data in MG too:

- (79) To 2030, i Maria tha pi oti ine sti filaki (*tote)
*In 2030, the Maria FUT say that be-PRS to-the jail (*then)*
‘In 2030, Maria will say that she was (literally: is) in jail (*then)’

The same holds for present shifted under future in a relative clause:

- (80) To 2030, i Zoi tha ine pantremeni me kation pu ine (*tote) sti filaki
*In 2030, the Zoi FUT be-PRS married to someone who be-PRS (*then) to-then jail*
‘In 2030, Zoe will be married to someone who is in jail (*then)’

The exception: Japanese

So far, the ‘then’-present generalization seems to be cross-linguistically robust. However, Japanese does not necessarily follow this pattern. Japanese is a non-SOT language with a shifted present. We asked three Japanese speakers⁴⁰ for their judgments of the following sentence:

- (81) ninenn mae, Yusuke-wa Yukiko-ga sono-toki ninnshinn shiteiru to shitteita.
2-years before Yusuke-top Yukiko-nom that-time pregnant be-PRS comp know-PST
‘2 years ago, Yusuke knew that Yukiko was (literally: is) pregnant then’

Two out of three speakers found the sentence acceptable. Interestingly, these were speakers who considered past-under-past to be ambiguous between a simultaneous and a back-shifted reading. The third one, who had a preference for back-shifted readings in simple past-under-past cases, found the sentence a bit odd (and judged it with a ??). This is the only language we have seen so far that contradicts the ‘then’-present generalization.

What is more, Japanese is the only language described so far, where the present tense shifts under past as well, as we saw in Chapter 2. It is, therefore, the only language where testing present-under-past in a relative clause with ‘then’ would be informative (since the sentence is acceptable without ‘then’). Surprisingly for the

⁴⁰ We thank Yusuke Kawamoto, Yukiko Kuwayama and Yasu Sudo for their judgments.

'then'-present generalization, but consistently with the present-under-past pattern in attitudinal environments, Yasu Sudo (p.c.) accepts the following sentence:

- (82) 20 nen mae, Yusuke wa sono-toki daitōryō datta hito to renkei
20 years before Yusuke TOP then president PAST man comp collaboration
o hakatte ita.
OBJ plan-IMPFV-PST
'20 years ago, Yusuke collaborated with a man who was (literally: is) then president'

Thus, it seems that the Japanese present is compatible with 'sono-toki'. This goes against the cross-linguistic picture, and we will simply state here as a puzzle within the 'then'-present puzzle. Hopefully, future research will shed more light into the semantics of 'sono-toki'.

English

Here, we would like to remind the reader, that the English present tense is not shiftable, contrary to the MG one. Therefore, it must be true at the time of the utterance (t^*). One can see this with present-under-past sentences, where the present cannot be evaluated at t^* :

- (83) *In 2000, John knew that Mary is pregnant.

However, if the present tense can be true at t^* , the generalization seems, at first notice, to hold in English too:

- (84) John knew two weeks ago that Mary is pregnant (*then)

Nevertheless, this is not informative, for the following reason: a present-under-past sentence in a language with an indexical present is expected to have a double-access reading, and thus the embedded clause is expected to refer to t^* . Thanks to Abusch's Upper Limit Constraint, it is also expected to refer to the time of the attitude. What matters here is that 'then' should be verifying t^* and the embedded present should too. Therefore, the two are presumably incompatible for the same reasons that matrix present tense is incompatible with 'then'.

Does this mean that we cannot test the 'then'-present generalization in English? As a matter of fact, we can, since the present tense can be shifted under the modal operator 'will', as in all languages. Therefore, the generalization can be tested with present-under-future in attitudinal environments as well as in relative clauses⁴¹:

- (85) In 2030, John will say that he is in jail (*then)

- (86) In 2030, John will be married to someone who is then in jail

As we can see the 'then'-present puzzle holds in attitudinal environments but not in relative clauses. Indeed, we find this in Fintel & Heim (2021), with 'then' at the final position:

- (87) In 2030, John will be married to someone who is in jail then Fintel & Heim (2021)

Therefore, in environments in which English is informative for our generalization, we have puzzling data. The pattern is confirmed in attitudinal environments, but relative clauses behave like Japanese ones. As we did before for Japanese, we leave the compatibility of 'then' and English present tense relative clauses as an open puzzle.

⁴¹ We thank Michael Goodale (p.c.) for the judgments.

Summary of Results

Here's a table summarizing the cross-linguistic picture with respect to the 'then'-present puzzle:

Table 4: Summary of 'then'-present puzzle findings

	'Then' + present-under-past		'Then' + present-under-future	
	Attitudes	Relative Clauses	Attitudes	Relative Clauses
Russian	*	uninformative	*	*
Hebrew	*	uninformative	*	*
MG	*	uninformative	*	*
English	uninformative	uninformative	*	OK
Japanese	OK	OK	No data	No data

Therefore, based on cross-linguistic data the 'then'-present puzzle seems to be the following:

'Then' cannot be added to a shifted present neither under past nor under future in both attitudinal and relative clause environments in MG, Russian and Hebrew.

Generalization 3: The 'then'-present puzzle

The Japanese present tense, as well as relative clauses in English constitute an exception to this puzzle.

4.2. Possible theories and refutation

Having presented the empirical picture, we will now refute the most plausible and first analyses that come to mind, leaving the puzzle open for future research. Let's focus on an existing analysis for the incompatibility of 'togda' in Russian with the shifted present.

Vostrikova (2018) argues that a presupposition 'togda' carries explains its incompatibility with the present tense. More specifically, in her system 'togda' is anaphoric to a contextually provided time interval, denoting a set of time intervals surrounding it. On top of that, there is a presupposition that the time intervals 'togda' denotes are not equal to the evaluation time:

$$(88) \llbracket \text{togda}_i \rrbracket^{w,t,g,c} = \lambda t' : t' \neq t . g(i) \subseteq t'$$

The fact that 'togda' (as well as 'then' in English) are incompatible with the present tense is explained by the clash of presuppositions between 'togda' and the present⁴². The latter presupposes that the denoted time interval is equal to the evaluation time, while 'togda' presupposes exactly the opposite.

In what follows, we will argue against the proposed presupposition of 'then', showing that there are cases where 'then' is compatible with the present tense cross-linguistically⁴³.

⁴² Here Vostrikova adopts an intensional system, thus 'then' and the present are expected to be evaluated with respect to the same parameter. In a system using explicit time variables rather than implicit time parameters, 'then' and the present could in principle be evaluated with different time variables and thus be compatible. In Appendix B we propose that on independent grounds a *Shift Together* rule in the domain of tense would block this. Data from MG seem to confirm this.

⁴³ The 'then'-present puzzle refutes Vostrikova's theory for another reason too: 'then' in MG is compatible with complex cases of past-under-past that can only be interpreted *de se*, while it is incompatible with their shifted present version. This shows that shifted present and deleted past are not completely equivalent from a semantic point of view. However,

4.2.1. Arguments against a surface incompatibility with the present

In this sub-section, we will show that:

- (i) There is no surface incompatibility between ‘then’ and the present tense morpheme
- (ii) ‘Then’ does not carry the presupposition that the denoted time interval is different than the evaluation time.

To support these conclusions, we will provide cross-linguistic data from: (i) the historical present and (ii) quantified present.

Indeed, let’s consider the first theory that comes to mind, given our paradigm. This would be the hypothesis that ‘then’ is incompatible with all kinds of present tense (i.e., not only matrix, but also shifted). This idea could be implemented as a morphological or as a semantic theory. The latter would be like Vostrikova’s (2018) theory, where the presuppositions of ‘then’ and the present tense clash. The morphological theory, would state that there is a surface incompatibility between ‘then’ and the present tense morpheme:

There is an incompatibility between ‘then’ and the present tense morpheme

Theory 1: The surface theory

Our first argument against the surface theory will be that ‘then’ is often cross-linguistically compatible with the historical present. Indeed, this is the case for Hebrew, French and MG. Let’s first consider the Hebrew data:

- (89) Zé yom kaitz yefeifé ve bimkom latzet im xaverim
It evening summer beautiful and instead go-out-INF with friends,
Miriam osa-PRS (az) et ha šeurim shela (AZ).
Miriam do-PRS (then) prep-direct-obj the homework hers (then)
‘It is a beautiful summer evening and instead of being out with friends, Miriam is (then) doing her homework (then).’
- (90) Anaxnu be 1943 ve ha germanim kovšim az et Tsarfat⁴⁴
We in 1943 and the Germans occupy-PRS then prep-direct-obj France
‘We are in 1943 and the Germans are then occupying France’

Thus, it seems that ‘az’ in Hebrew can be compatible with the present tense in some contexts and may denote a time interval equal to the evaluation time, at least for the historical present. The same holds for French and MG:

- (91) En 1943, les Allemands occupent une bonne partie de l’Europe,
In 1943 the Germans occupy-PRS a good part of the-Europe,
et la France est alors sous leur domination.
and the France be-PRS then under their domination
‘In 1943, the Germans occupy a significant part of Europe and France is then under their rule’
- (92) Imaste sto etos 1943 ke i Jermani echun tote ipo tin

as Vostrikova notes herself in her paper, she takes the two to be equivalent (explaining the compatibility of ‘togda’ in Russian with past-under-past via a *de re* analysis, which will not work for MG). We refer the interested reader to Appendix A.

⁴⁴ In this case, ‘az’ would not work at the end. It seems that the position of ‘then’ matters. However, we will not delve deeper into the issue here, leaving this open for future research.

*Be-PRS to-the year 1943 and the Germans have-PRS then under the
katochi tus tin Jalia.
occupation theirs the France
'We are in 1943 and the Germans are then occupying France'*

However, the data are less clear for English and Russian:

(93) In 1943, the Germans are occupying a large part of Europe, and (??then) France is (then) under their domination.

(94) ??We are in 1943 and the Germans are then occupying France.⁴⁵

(95) Xorošij letnij večer, no vmesto togo čtoby byt' s druž'jami, Maša (*togda)
*Beautiful summer evening, but instead of than be-PRS with-friends, Maša (*then)*
delaet domašnjuju rabotu (*togda).
*do-PRS home work (*then)*

Intended: 'It is a beautiful summer evening but instead of being out with friends, Masha is (then) doing her homework (then).'

(96) My v 1943 godu, i nemcy (*togda) zaxvatyvajut Franciju.
*We in 1943 year, and Germans (*then) occupy-PRS-IMPFV France.*

Intended: 'We are in 1943 and the Germans are then occupying France'

These data from the historical present show that the surface theory as well as Vostrikova's (2018) presupposition cannot be true for MG, French and Hebrew.⁴⁶ However, it could still be the case that 'then' behaves differently in Russian and in English, being incompatible with the present tense. After all, we should be very cautious with inferences from one language to another since they are only valid so long as we expect the phenomenon to have a uniform analysis cross-linguistically.

Nevertheless, these theories do not hold for English either, since (i) 'then' is compatible with the historical present sometimes (see (93)) and (ii) 'then' is compatible with the present tense shifted under 'will' in relative clauses (see (86)). As for Russian, we will argue that 'togda' is compatible with a quantified present:⁴⁷

Context: I just received my schedule for the upcoming semester.

(97) Po ponedel'nikam u menja semantika i tol'ko togda ja v universitete.
On Mondays near me semantics and only then I in university.
V ostal'nye dni klassy onlajn.
In rest days classes online.

⁴⁵ We thank once again Michael Goodale (p.c.) for these judgments. Michael also pointed out that 'now' would work better in this context for English:

(i) We are in 1943 and the Germans are now occupying France.

⁴⁶ We note here that this can also note be true for Japanese, since as we saw 'sono-toki' is indeed compatible with the present tense, being an exception to the 'then'-present puzzle. Yet, as we said earlier, we will leave this for future research.

⁴⁷ We used 'only' in this example to justify the use of 'then', which would be verbose otherwise. Also, notice that this example refutes another theory too, namely that 'then' is ambiguous, between an *anaphoric* reading incompatible with the present and a *successor* reading compatible with the present. This idea arose during a discussion with Yael Sharvit. In fact, 'then' in **Error! Reference source not found.** is compatible with the present even though it cannot have the successor reading since it cannot be paraphrased as 'later'.

‘On Mondays I have semantics and only then am I at the main university building. The rest of the days classes are online.’

This can be replicated in English:

(98) On Mondays I have semantics and only then am I at the main university building. The rest of the days classes are online.⁴⁸

Thus, the morphological theory cannot be true since cross-linguistically ‘then’ can be compatible with the present tense. As for the semantic theory of incompatibility with the present, this cannot be true either since all the examples where the present and ‘then’ co-occur should be presupposition failures, which they are not. Therefore, we argue that ‘then’ does not carry the presupposition proposed in Vostrikova (2018).

In this sub-section, we refuted the incompatibility between the present tense and ‘then’, based on cross-linguistic data from the historical present as well as cases of quantified present. Now, we turn to another plausible theory, namely that ‘then’ is in competition with ‘now’.

4.2.2. Arguments against competition theories

We will consider two plausible competition theories: (i) competition with ‘now’ and (ii) competition with the present. Let’s first focus on (i). The idea behind this theory is that ‘then’ and ‘now’ are in complementary distribution. Therefore, if ‘then’ is incompatible with the shifted present, that’s because a shifted ‘now’ is compatible with it. The hypothesis would be the following:

‘Then’ is in competition with ‘now’. The two are in complementary distribution.

Theory 2: Competition with ‘now’

This would be supported by Russian, at least based on Vostrikova (2018):

(99) *Kogda ja govorila s nej tri goda nazad, Tanja skazala,*
when I talk-PST with her three years ago Tanja say-PST
čto ona (sejčas) beremenna
that she (now) pregnant

‘When I talked to her three years ago, Tanja told me that she was (literally: is) pregnant (at that time).’

It seems that Russian sometimes has a shiftable ‘now’. However, as we will see this is not the case for all Russian speakers. What is more, this theory will not work for MG, where ‘now’ is an unshiftable indexical and must refer to the time of the utterance. In other words, we will see that the MG shifted present is incompatible with both ‘then’ and ‘now’. This will also be the case under certain verbs in Russian.

‘Now’ may (at least in certain cases) be shifted in Russian and Hebrew. Therefore, based on these languages one could think that ‘then’ is incompatible with the shifted present because we can use ‘now’ instead to express the same meaning. However, this is not the case for all languages with a shiftable present. In MG ‘now’ is an unshiftable indexical, obligatorily referring to the time of the utterance. Therefore, neither ‘then’ nor ‘now’ may be used with the shifted present to get a simultaneous reading, suggesting that the two are not in competition:

⁴⁸ Our consultant points out that this sentence would sound fine only if the university building was under question, e.g., if one had asked ‘You’re at the main university building all week?’.

(100) To 1960, o Yanis iksero oti i Maria ine omorfi (*tote)/(#tora)
*The 1960, the Yanis know-PST that the Maria is-PRS beautiful (*then)/(#now)*
 'In 1960, Yanis knew that Maria was (literally: is) beautiful (*then) / (#now)'⁴⁹

The same holds for our two Russian consultants, who read 'now' indexically, at least under 'know'⁵⁰:

(101) V dvux tysjačnom godu Ivan znal, čto (*togda) / (#sejčas) Maša beremenna.
*In 2000 year Ivan know-PST that (*then) / (#now) Masha pregnant*
 'In 2000, Ivan knew that Mary was (literally: is) pregnant (*then) / (#now)'

Even though we have shown that 'then' is not in competition with 'now', it could still be the case that 'then' is in competition with using the present tense alone:

'Then' is in competition with the present.

Theory 3: Competition with the present

However, we will see in the following examples with 'only' that 'then' is not always in competition with the present. This is because 'only' presumably needs to modify something and therefore the use of 'then' should be licensed. Nevertheless, we will see that the 'then'-present puzzle still holds. Therefore, the puzzle cannot be accounted for in terms of competition with the present.

Consider the following examples, where 'then' will not be in competition with the present and yet it will still be infelicitous with it. We gave consultants the following context (changing only the name each time):

Ivan is suffering from depression. The day he got his PhD, however, he was extremely happy. His thought on that day was 'Only now am I happy'. Afterwards, he got back to feeling bad.

Here are the judgments we got for Russian:

(102) Ivan skazal čto tol'ko togda on byl sčastliv
Ivan say-PST that only then he be-PST happy-IMPFV
 'Ivan said that only then was he happy'

(103) # Ivan skazal, čto tol'ko togda on sčastliv.⁵¹
Ivan say-PST that only then he happy-IMPFV

Intended: 'Ivan said that only then was (literally: is) he happy'

We can see that the last example is infelicitous, even though 'then' is licensed thanks to the use of 'only' that needs to modify something. As a matter of fact, using 'only' with the present alone would be ungrammatical.

⁴⁹ The sentence with 'then' is ungrammatical. However, the sentence with 'now' may have the meaning that in 1960, Yanis knew that Maria is beautiful now in 2021. Of course, this is pragmatically odd and not the targeted meaning, therefore we use the # sign.

⁵⁰ Interestingly, at least for one consultant, there seems to be a scale with respect to how accessible the shiftable reading of 'now' is. More specifically, 'now' is read indexically under 'learn, know, believe', less so under 'suspect' and it is shiftable under 'say'. For another consultant, 'now' was an unshiftable indexical, like in MG. Therefore, there seems to be within-speaker variation with respect to the shiftable reading of 'now' in Russian. We simply state this as an observation at this point, leaving this open for future research.

⁵¹ This example does not work with 'now' either and it can therefore be used as an argument against the first competition theory too:

(i) # Ivan skazal, čto tol'ko sejčas on sčastliv
Ivan say-PST that only now he happy-IMPFV
 Intended: 'Ivan said that only then (literally: now) was (literally: is) he happy'

Thus, ‘then’ is not in competition with the present tense and if this theory was true, such examples should be felicitous. Therefore, the infelicity of ‘then’ added to a shifted present is not due to competition with the present since it persists at the absence of any competition.

The same was observation can be made for Hebrew too⁵²:

(104) Dan he'emin še rak az hu haia same'ax
Dan believe-PST that only then he be-PST happy
 ‘Dan believed that only then was he happy’

(105)# Dan he'emin še rak az hu same'ax
Dan believe-PST that only then he happy
 Intended: ‘Dan believed that only then was (literally: is) he happy’

And for MG⁵³:

(106) O Marios nomize oti mono tote itan harumenos
The Marios think-IMPFV-PST that only then be-PST happy
 ‘Marios thought that only then was he happy’

(107)# O Marios nomize oti mono tote ine harumenos
The Marios think-IMPFV-PST that only then be-PRS happy
 Intended: ‘Marios thought that only then was (literally: is) he happy’

In these examples, the past-under-past sentence has a simultaneous interpretation that the present-under-past one cannot have⁵⁴. This shows that even at the absence of any competition at all, ‘then’ is incompatible with the shifted present. Thus, we conclude that competition theories of ‘then’ will not work.

Also, notice that even though the standard strategy to get the simultaneous reading in Hebrew and Russian is a present-under-past sentence, this strategy is no longer available. The only way to express the simultaneous reading with ‘only then’ is with an embedded past, in both non-SOT languages and mixed tense ones like MG.

4.3. Summary

All in all, in this chapter we presented the ‘*then*’-present puzzle, namely that ‘then’ is incompatible with the shifted present. We also refuted the simplest initial theories in terms of incompatibility with the present and competition with ‘now’ or the present. The ‘*then*’-present puzzle is crucial since it shows that deleted past and shifted present are not completely equivalent. In a mixed tense language like MG, which has both a shifted

⁵² In Hebrew the same meaning that ‘only then’ + past has can be achieved with ‘only now’ + present:

(i) Dan he'emin še rak axšav hu same'ax
Dan believe-PST that only now he happy
 ‘Dan believed that only then (literally: now) was (literally: is) he happy’

Therefore, Hebrew would fit the first competition theory. For all we know, ‘then’ could be in competition with ‘now’ in Hebrew.

⁵³ In MG, like in Russian, this example is infelicitous with ‘now’ as well:

(i) # O Marios nomize oti mono tora ine harumenos
The Marios think-IMPFV-PST that only now be-PRS happy
 Intended: ‘Marios thought that only then (literally: now) was (literally: is) he happy’

⁵⁴ The only possible reading of the present-under-past sentence is a conditional/generic meaning, i.e., ‘only given these conditions may he be happy’. However, this is odd in the context.

present and a deleted past, 'then' is only compatible with the latter. If the two roads to the simultaneous reading were completely equivalent, 'then' should be compatible with both, especially since it is compatible with the present tense in other environments. Thus, the fact that 'then' is only compatible with a deleted past indicates that the latter is not completely equivalent to a shifted present from a semantic point of view. A direction for future research would thus be to find the difference between shifted present and deleted past that can account for the '*then*'-present puzzle in MG. In Appendix A we focus on the interaction between 'then' and past-under-past sentences cross-linguistically, providing a preliminary analysis. In Appendix B we mention some directions for future research with respect to the '*then*'-present puzzle.

5. Conclusion

All in all, in this thesis we focused on embedded tense in MG, while also considering cross-linguistic data which provided important insights for our analysis. Firstly, we established that MG has an SOT rule, as well as that there is optionality between an embedded present or an embedded past to convey the simultaneous reading. We initially offered an analysis, arguing that there are two roads to the simultaneous reading in MG. This analysis made use of a *Prefer De Se* (LFs) pragmatic principle and was motivated by data on non-SOT languages, where past-under-past sentences have been described to have a more salient back-shifted reading.

Then, we investigated further the accessibility of simultaneous readings in non-SOT languages, finding that there is complete ambiguity in Russian and within-speaker variation in other non-SOT languages like Hebrew. In other words, a past-under-past sentence for a non-SOT speaker may either be ambiguous between the simultaneous and the back-shifted reading or the latter is more salient. Given these findings, we revised our initial analysis of *Prefer De Se*, specifying that it refers to *de se* readings rather than LFs. Crucially, given the approach to *de re* we adopted, *de se* readings can be obtained via *de re* LFs as well. The variation observed with respect to the accessibility of simultaneous readings of past-under-past cross-linguistically was then accounted for thanks to a syntactic *Prefer Local Binding* parameter. This parameter favored bound temporal variables over the non-bound ones found in *de re* LFs; thus, the preference for a back-shifted reading in some non-SOT languages and/or for some speakers was explained. What is more the ambiguity of past-under-past in Russian was predicted, on the assumption that Russian is a language in which *Prefer Local Binding* is not active (at least for temporal variables). As for SOT languages, we proposed that data from ellipsis could reveal the value of this parameter.

Finally, we introduced the *'then'-present puzzle*. This refers to the observation that 'then' is incompatible with the shifted present. This had been described for present-under-past sentences in Hebrew and Russian, yet we extended it to present-under-future ones, strengthening the generalization. What is more, we provided novel MG data, showing that the *'then'-present puzzle* holds in mixed tense languages as well. Finally, we showed that 'then' can be compatible with some other kinds of present and we refuted competition-based accounts, leaving the puzzle open. Importantly, this puzzle in conjunction with the fact that 'then' is compatible with embedded past suggests that the shifted present and the deleted past are not completely equivalent from a semantic point of view.

In Appendix A we argue that 'then' added to past-under-past sentences disambiguates them, forcing either the simultaneous or the back-shifted reading, depending on the language and the speaker. We also refute a *de re* analysis of 'then', proposing that it is ambiguous between an anaphoric and a deictic reading.

In Appendix B we provide some directions for future research with respect to the *'then'-present puzzle*. We propose to give an indexical analysis of 'then', as well as introduce a *Shift Together* principle in the domain of tense. Preliminary data from MG seem to confirm the existence of such a principle.

In Appendix C we present a puzzle about the future, arguing that future-under-future sentences may have a simultaneous reading in MG.

Appendix A: ‘Then’ in past-under-past configurations

Ogihara & Sharvit (2012) and Vostrikova (2018) have observed that adding the adverbial ‘then’ to a past-under-past sentence forces the simultaneous reading. In this Appendix we will modify this generalization, arguing that whenever ‘then’ is added to a past-under-past sentence, it forces either a simultaneous or a back-shifted reading. We will also provide a preliminary analysis.

MG will be crucial in this cross-linguistic investigation as a mixed tense language, where both the present and the past-under-past may be used to express the simultaneous reading. Having established in Chapter 2 that MG has a deletion rule in addition to a shiftable present tense, we will state a new puzzle: how come shifted present and deleted past behave differently in MG with respect to the adverbial ‘then’ if the two are equivalent from a semantic point of view?

A.1. Main empirical generalizations

We have seen that ‘then’ is incompatible with the shifted present. What about past-under-past sentences? We will see that not only is ‘then’ compatible with past-under-past sentences, but it also disambiguates them, choosing between the simultaneous or the back-shifted reading depending on the language and the speaker.

A.1.1. Greek & Russian: simultaneous readings

As Vostrikova (2018) observed for Russian, whenever ‘togda’ is added to a past-under-past sentence, it forces a simultaneous reading of the embedded past. Indeed, our consultants had the same judgement, as we can see in the following example:

(108) *V dvuxtysjačnom godu Ivan znal, čto togda Maša byla beremenna.*
In 2000 year Ivan know-PST that then Masha be-PST pregnant
‘In 2000, Ivan knew that Mary was pregnant then’

For one consultant this sentence is ambiguous without ‘then’, while for another it has a more salient back-shifted reading. What matters for our purposes is that whenever ‘togda’ is added, it unambiguously has a simultaneous reading.

In languages with an SOT rule, like English, this is expected since a past-under-past sentence has a most salient simultaneous reading in the first place:

(109) In 2000, John knew that Mary was pregnant (then)

As an SOT language, MG has a deletion rule and is thus expected to behave like English. This is indeed what is observed:

(110) *To 2000, o Yanis iksero oti i Maria itan tote egkios*
The 2000, the Yanis know-PST that the Maria be-PST then pregnant
‘In 2000, John knew that Mary was pregnant then’

Even though the English and MG data are expected, the Russian data are more surprising. Russian is a non-SOT language and as such usually has a more salient back-shifted reading for past-under-past sentences. However, as we saw in Chapter 3, it turns out that for most of our consultants in Russian past-under-past sentences were ambiguous. What is more, all Russian speakers can access a simultaneous reading of a simple past-under-past sentence in the first place. Therefore, it seems that what ‘togda’ does is accentuate this already accessible simultaneous reading of the embedded past. In the case of SOT languages, like English and

MG, where the simultaneous reading is already the default, ‘then’ does not make its effect felt. Based on data from SOT languages and Russian, we would therefore be licensed to conclude, like Vostrikova (2018), that ‘then’ forces a simultaneous reading⁵⁵. We will see however, that this is not always the case.

A.1.2. Hebrew & Japanese: within-speaker variation

In this sub-section, we will show that there are two types of Hebrew and Japanese speakers with respect to readings with ‘then’. Some get a simultaneous reading whenever ‘then’ is added to a past-under-past sentence; others get a back-shifted one⁵⁶. What is common in both types of speakers, however, is that ‘then’ disambiguates the sentence. Only the first type of speaker has been described in the literature (Ogihara & Sharvit (2012), Kusumoto (1999)). Here, we will make the additional claim that if the back-shifted reading was the most salient reading to begin with, ‘then’ cannot override it.

Ogihara & Sharvit (2012) mention that ‘then’ may be used to force a simultaneous reading for some speakers, giving the following example:

- (111) Yosef xašav še Miriam ahava oto az.
Yosef think-PST that Miriam love-PST him then
 ‘Yosef thought that Miriam loved him then’

However, for our consultant, this was not the case. They had a strong preference for the back-shifted reading with simple past-under-past sentences. Whenever ‘az’ (‘then’) was added, the sentence unambiguously had the back-shifted reading:

- (112) Be šnat alpa'im, Yosef yada še Miriam haita az be-heraion
In year 2000, Yosef know-PST that Miriam be-PST then pregnant
 ‘In 2000, Yosef knew that Miriam had then been (literally: was) pregnant’

As for Japanese, opinions in the literature diverge. Ogihara only gets the back-shifted reading with past-under-past sentences and does not accept them with ‘sono-toki’ (Ogihara & Sharvit, 2012):

- (113) Zyuunen mae, Bill-wa Sue-ga (#sono-toki) byooki-dat-ta to sit-te i-ta.
Ten-years ago Bill-top Sue-nom (#that-time) be-sick-PST that know-PST
 ‘Ten years ago, Bill knew that Mary was sick (#then).’
- (114) 2005-nen ni Joseph-wa Mary-ga (#sono-toki) zibun-o aisi-te
2005-year at Joseph-top Mary-nom (#that-time) self-acc love-IMPFV-PST
 i-ta-to sinzi-te i-ta.
that believe-IMPFV-PST
 ‘Joseph believed in 2005 that Mary loved him (#then).’

On the contrary, Kusumoto (1999, Ch.2), accepts such sentences, describing them as ambiguous. Whenever there is a contextually salient past moment, they have the back-shifted reading; at the absence of context, they have the simultaneous reading.

- (115) Junko-wa Satoshi-ga sonotoki byookidatta to itta

⁵⁵ Unless there is a specific time previously mentioned in the discourse that ‘then’ is anaphoric to. Since we give no context here, there is no such time in our examples.

⁵⁶ Assuming that there is no salient past time in the context that ‘then’ can be anaphoric to. The examples we present are precisely out-of-the-blue ones.

Junko-top Satoshi-nom that-time sick-PST comp say-PST
 ‘Junko said that Satoshi was sick then’

(116) *Mako-wa sono-toki zibun-wa yopparateinakatta to syutyoosita*
Mako-top that-time self-top drunk-NEG-PST comp insist-past
 ‘Mako insisted that she was not drunk then’

We will claim that in Japanese too, there are two types of speakers. One of our consultants, consultant A, took past-under-past sentences to be ambiguous, but preferred the back-shifted reading. Whenever ‘sono-toki’ was added, the sentence unambiguously had the back-shifted reading. However, there is another type of speaker too. Another consultant, call them B, considered past-under-past sentences generally ambiguous, with no preference for one of the two readings. Whenever ‘sono-toki’ was added, the simultaneous reading was forced:

(117) *ninenn mae, Yusuke-wa Yukiko-ga sonotoki ninnshinn shiteita to shitteita.*
2-years ago Yusuke-top Yukiko-nom that-time pregnant be-PST comp know-PST
 Consultant A: ‘2 years ago, Yusuke knew that Yukiko had been (literally: was) pregnant then’
 Consultant B: ‘2 years ago, Yusuke knew that Yukiko was pregnant’

Therefore, it seems that in non-SOT languages other than Russian⁵⁷ ‘then’ added to a past-under-past sentence forces either the simultaneous or the back-shifted reading. Within-speaker variation is observed, and this possibly has to do with the extent to which a simultaneous reading was available in the first place for a given speaker. In other words, whenever a simultaneous reading is salient, ‘then’ forces it (as has been described in the literature); but if the back-shifted reading is more salient, ‘then’ forces that reading instead. We conclude that ‘then’ added to a past-under-past sentence of a non-SOT language disambiguates it.

A.1.3. Summary of findings

Here’s a summary table of our findings with respect to the interaction between ‘then’ and embedded past:

Table 5: Readings of past-under-past with ‘then’

Language:	‘then’ + past-under-past
English	Simultaneous (expected)
French	Simultaneous (expected)
Greek	Simultaneous (expected)
Russian	Simultaneous (for all)
Hebrew	Simultaneous (for some) / Back-shifted (for others)
Japanese	Simultaneous (for some) / Back-shifted (for others)

First, we can see that in languages with an SOT rule, where the simultaneous reading was the default one, the addition of ‘then’ does not change anything. Secondly, we have non-SOT languages, where past-under-past sentences are ambiguous, such as Russian; there, the addition of ‘todga’ forces a simultaneous reading for all speakers. Finally, we have non-SOT languages, where past-under-past sentences are ambiguous for some but have a back-shifted interpretation for most. In these cases, we observe within-speaker variation, since ‘then’ forces a simultaneous reading for some and a back-shifted one for others.

⁵⁷ In Russian there is a clear ambiguity for past-under-past sentences, as we saw in Chapter 3.

We confirmed the observation that ‘then’ forces a simultaneous reading in Russian (Vostrikova, 2018), as well as for some Japanese speakers (Kusumoto, 1999). However, we added that for some Hebrew and Japanese speakers ‘then’ forces a back-shifted interpretation instead. Thus, the generalization seems to be the following:

‘Then’ disambiguates past-under-past sentences, forcing:

- a. A simultaneous reading in languages with an SOT rule and in Russian
- b. A simultaneous or a back-shifted reading in Hebrew and Japanese

Generalization 4: ‘Then’ disambiguates past-under-past

A.2. Shifted present and deleted past behave differently

Based on the data from Chapter 4 and this Appendix, we have two main generalizations: what we called the ‘then’-present puzzle and ‘then’ disambiguating past-under-past sentences. In Chapter 4, we also saw that sometimes, e.g., when ‘then’ is forced using ‘only’, the only way to express a simultaneous reading even in mixed tense languages like MG is via an embedded past. From these empirical observations, we can conclude the following:

- a. The fact that ‘then’ may be added to a past-under-past sentence, but not to a present-under-past one shows that the two roads to the simultaneous reading are not equivalent.
- b. In a specific context requiring ‘then’, only one way to the simultaneous reading may be possible, namely a past-under-past sentence.

The first conclusion is expected for non-SOT languages, since present-under-past is a way to the simultaneous reading via a *de se* LF, while past-under-past is another way via a *de re* LF. However, it is not expected for MG, where thanks to the deletion rule past-under-past has also a *de se* LF and should from a semantic point of view be equivalent to present-under-past. The fact that these observations about ‘then’ hold in a mixed tense language like MG could therefore indicate that semantically a shifted present is not completely equivalent to a deleted past. Hopefully, future research will clarify this.

A.3. The analysis

Having presented the empirical picture, we will now focus on an existing analysis for ‘togda’ in Russian. Vostrikova (2018) makes argues that ‘togda’ forces a simultaneous reading when added to an embedded past. First, we will briefly present the main idea behind this analysis and then we will provide counterexamples, showing that it will not suffice to explain all cases.

Vostrikova (2018) takes past-under-past sentences with ‘togda’ to have a *de re* LF (see Kusumoto (1999, Ch.2) for a similar analysis of Japanese ‘sono-toki’). This accounts for the simultaneous reading, while a presupposition ‘togda’ carries explains its incompatibility with present tense.

More specifically, in her system ‘togda’ is anaphoric to a contextually provided time interval, denoting a set of time intervals surrounding it. On top of that, there is a presupposition that the time intervals ‘togda’ denotes are not equal to the evaluation time:

$$(118) \llbracket \text{togda}_i \rrbracket^{w,t,g,c} = \lambda t' : t' \neq t . g(i) \subseteq t'$$

The simultaneous reading is accounted for by the *de re* reading of the embedded past. ‘Togda’ is anaphoric to the time of the utterance, denoting that the embedded sentence is happening at a time interval surrounding it.

In what follows we will see why a *de re* analysis of the embedded past will not suffice, namely cases where the embedded past is necessarily read *de se* and ‘*togda*’ is felicitous. More importantly, this is problematic if we wanted to extend this analysis to SOT languages.

A.3.1. Arguments against a *de re* analysis

If the simultaneous readings of past-under-past with ‘*togda*’ are accounted for by a *de re* analysis of the embedded past, then it should not be possible to add it to an environment where no such analysis is possible. These would be the complex examples we have previously discussed, where the embedded past is no later than any other moment in the sentence. Let us first look at non-SOT languages:

- (119) Nyedyelyoo nazad, Ivan skazal, čto čyeryez 10 dnyey on skazhyet svoey
Week back, Ivan say-PST that across 10 days he say-FUT his
dyevooshkye, čto oni togda vstryetilis' v poslyedniy raz.
girlfriend, that they then meet-PST-PFV in last time.
‘A week ago, Ivan said that in 10 days he would say to his girlfriend that they have then met for the last time’

We tested this with three consultants, two of whom accepted the sentence and got a back-shifted reading with ‘*togda*’. Vostrikova (p.c.) herself did not like this sentence with ‘*togda*’ (therefore a larger-scale judgment collection could be useful in future research). The same holds for another non-SOT language, Hebrew:

- (120) Lifney šavua, Yosef amar še be'od asara yamim hu yagid le
Before week, Yosef say-PST that in ten days he say-FUT to
xavera šelo še az hem nifgešu ba pa'am ha'axrona.
girlfriend his that then they meet-PST for last time.
‘A week ago, Yosef said that in ten days he would say to his girlfriend that they have then met for the last time’

Our consultant accepted ‘then’ in this sentence⁵⁸ with a back-shifted reading.

Even more importantly, this is also the case for SOT languages, where ‘then’ may be added to these examples with a simultaneous reading:

- (121) Prin mia evdhomadha, o Jorghos ipe oti se dheka meres tha
Before one week the Jorghos say-PST that in ten days will
eleghe stin kopela tu oti sinadjiondusan tote ja teleftea fora.
say-IPFV-PST to-the girlfriend of-his that meet-IMPV-PST then for last time
‘A week ago, Jorghos said that in ten days he would say to his girlfriend that they were meeting then for the last time’

This sentence unanimously has the simultaneous reading for our consultants and yet no *de re* LF of the embedded past is available, as we explained in more detail in the previous chapters. Therefore, we must assume a deletion rule, giving rise to a *de se* LF, with deleted past tense features. Notice that this is also the case for its English equivalent. As Vostrikova notes herself in the paper, a deleted tense is interpreted at the local evaluation time and thus, given her semantics of ‘then’, it is predicted to be infelicitous with the

⁵⁸ Interestingly, our consultant accepts ‘axšav’ (now) here too, with the same meaning. Therefore, the two are not in complementary distribution since they can co-occur (confirming the conclusion we had already made based on MG).

simultaneous reading of the past tense. We conclude that this analysis cannot be extended to account for the cross-linguistic picture, since ‘then’ (i) can be added in past-under-past environments where only a *de se* LF may give rise to the simultaneous reading (which is the case for English and MG) and (ii) may be added to a past-under-past sentence in non-SOT languages without forcing a simultaneous *de re* LF (as is the case for some Hebrew and Japanese speakers).

A.3.2. Accounting for simultaneous and back-shifted readings

We will pursue the intuition that ‘then’ works like a temporal pronoun, being able to refer to a time interval that has either been previously mentioned in the sentence or is salient in the context. We will note this time interval as t_x . Thus, ‘then’ has the following two readings:

- (i) Anaphoric reading (t_x linguistically given)
- (ii) Deictic reading (t_x given by the context)

Let’s now propose a lexical entry for ‘then’:

$$(122) \llbracket \textit{then}_x \rrbracket^{w,t,g} = \lambda p_{\langle s,t \rangle} \cdot p(g(t_x))$$

We adopt a system with explicit time variables, where the world, the time of evaluation and the assignment function are parameters contextually provided. ‘Then’ is a function that takes the intension of a sentence as input and gives a truth value as output. What it does is evaluate the sentence at the time interval it denotes. The temporal interval is assigned to x by the assignment function g . ‘Then’ is a pronoun referring to t_x .

The question that remains open is: how do we choose between the anaphoric and the deictic reading? We assume the following:

‘Then’ prefers the anaphoric reading whenever it can

Assumption 1: Preference for anaphoric reading

This assumption is motivated by the intuition that as a temporal pronoun, ‘then’ wants to refer to a temporal interval as soon as possible. Thus, the preference for the anaphoric reading. The latter gives rise to a simultaneous reading of past-under-past, as the embedded past refers to the temporal interval introduced by the matrix one. However, if the anaphoric reading of the embedded past is not available in a given language or for a specific speaker, in this case ‘then’ is deictic, its denotation being provided contextually. Thus, the back-shifted reading arises.

In other words, the cross-linguistic variation observed in readings of past-under-past with ‘then’ has to do with the extent to which simultaneous readings were available in the first place. More concretely, in Russian, where past-under-past was already ambiguous, as well as in SOT languages, such as English and MG, where it already had a simultaneous reading, there is a preference for the anaphoric reading of ‘then’. Thus, whenever it is added to a past-under-past sentence, the embedded sentence ends up being evaluated at the same temporal interval as the matrix one. On the contrary, in Hebrew or Japanese (at least for some speakers), the past-under-past sentence has the back-shifted reading. Therefore, since the anaphoric reading is not available, ‘then’ is interpreted deictically, referring to a salient past moment provided contextually. This is how the back-shifted reading arises. Here is a table summarizing this:

Table 6: Readings of ‘then’

Language:	Reading of past-under-past	Reading of ‘then’
MG/English (SOT languages)	Simultaneous	anaphoric
Russian	Ambiguous	anaphoric

Hebrew/Japanese (some speakers)	Back-shifted	deictic
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Finally, we should note that since the preference for an anaphoric reading of 'then' depends on the availability of simultaneous readings of past-under-past, within-speaker variation in non-SOT languages is observed (as was the case for past-under-past sentences in Chapter 3). Of course, this proposal is at a preliminary stage and should be spelled out in more detail in future research.

Appendix B: Shift together in the domain of tense

In Chapter 4 we presented the ‘then’-present puzzle and showed that competition-based accounts cannot account for it. Here, we propose a direction of future research, based on independent evidence we have for a *Temporal Shift Together* rule in MG.

B.1. Temporal Shift Together

It seems that in MG we cannot mix temporal perspectives. Indeed, this is what we unanimously observed with our consultants for both complement clauses under past and relative clauses under future:

(123) #Prin 5 chronia o Markos iksero oti i Zoi itan egkios
Before 5 years the Markos know-PST that the Zoi be-PST pregnant
ke oti ine se ghoniki adhia
and that be-PRS in maternity leave

Intended: ‘5 years ago Markos knew that Zoe was pregnant and that she was (literally: is) in maternity leave’

(124) #Prin 5 chronia o Markos iksero oti i Zoi ine se ghoniki adhia
Before 5 years the Markos know-PST that the Zoi be-PRS in maternity leave
ke oti itan egkios
and that be-PST pregnant

Intended: ‘5 years ago Markos knew that Zoe was (literally: is) in maternity leave and that she was pregnant’⁵⁹

Conjoining an embedded present with an embedded past (in any order) is unacceptable. On the contrary, conjoining two embedded pasts or two embedded presents is acceptable and truth-conditionally equivalent. What is more, this also holds for relative clauses under future⁶⁰:

(125) #Se 20 chonia i Anula tha kani pedhia pu tis miazun ke pu
In 20 years the Anula will have children who hers look-like-PRS and who
tha ine paneksipna
will be-PRS very-smart.

Intended: ‘In 20 years, little Anny will have children that look like her and who are (literally: will be) very smart’

(126) #Se 20 chonia i Anula tha kani pedhia pu tha tis miazun ke pu
In 20 years the Anula will have children who will hers look-like-PRS and who
ine paneksipna
be-PRS very-smart.

Intended: ‘In 20 years, little Anny will have children that will look like her and who will be (literally: are) very smart’

⁵⁹ We note that in all our examples we changed the order of the predicates to control for the hypothesis that the infelicity of the sentence is due to the order of the predicates rather than the tenses. Even though we only present two versions here, we did test all possible combinations of tenses and predicates, with the same result. Thus, we conclude that the infelicity of such cases does not come from the predicates, but from the mixing of temporal perspectives.

⁶⁰ As we will see in Appendix C, future-under-future sentences in MG can have a simultaneous reading.

The generalization seems to be the following:

In MG, we cannot mix temporal perspectives neither under attitude verbs nor under ‘will’.

Generalization 5: Against mixing of temporal perspectives

We should also note that the data from relative clauses show that the constraint against mixing of temporal perspectives is not restricted to attitudinal environments but is broader.

This is reminiscent of a *Shift Together* rule in the domain of tense. Let’s call this rule *Temporal Shift Together* (see Anand & Nevins (2004), Quer (2005), Deal (2017), Schlenker (2017), Anvari (2019) a.o.):

All temporal indexicals within the same domain should be evaluated in the same context.

Definition 5: Temporal Shift Together

B.2. ‘Then’ is indexical

We propose to give an indexical semantics for ‘then’. We adopt a system with designated time variables instead of an intensional system like Vostrikova (2018) did. We could encode in the lexical entry of ‘then’ that it denotes a time other than the time of the context with a presupposition à la Vostrikova. Using the notation of Heim & Kratzer (1998):

$$(127) \llbracket \textit{then}_x \rrbracket^{w,t,g} = \lambda p_{\langle s,t \rangle} : g(t_x) \neq t . p(g(t_x))$$

‘Then’ is a temporal pronoun with an index x , and \textit{then}_x corresponds to the temporal variable t_x . The presupposition makes sure that it is only defined if it denotes a temporal interval other than the one of the context. What matters is that ‘then’ in its semantics makes use of the time coordinate of the context and is thus indexical. Contrary to ‘now’, which denotes the time of the context, ‘then’ would be exactly the opposite, denoting a time interval that is not the one of the context. Thus, one could say that ‘then’ is ‘anti-indexical’ in a sense since it has the opposite requirements of a ‘standard’ indexical like ‘now’.

The present tense would be analyzed as a ‘standard’ indexical (a shiftable one in languages with a shiftable present), denoting the temporal interval of the context. Therefore, the prediction would be the following:

If ‘then’ and the present are evaluated with respect to the same context, then they must denote different times (and thus cannot constraint the same temporal argument).

In view of our semantics which make use of explicit temporal intervals⁶¹, we can account for the ‘then’-present puzzle on condition that these two expressions are evaluated with respect to the same context. The independently motivated *Temporal Shift Together* rule in MG makes sure that they are.

The rule would apply to ‘then’ as well in virtue of it being indexical. We predict that languages where the rule is active cannot mix temporal perspectives. In other words, ‘then’ and the present cannot be evaluated with respect to different contexts. If the embedded present behaves like a shiftable indexical, being interpreted from the point of view of the attitude holder’s ‘now’, ‘then’ can be neither anaphoric nor deictic; it must also be interpreted in the same context as the present. Hence, there is a presupposition failure, and the ‘then’-present puzzle is predicted. Further research is needed in MG, as well as cross-linguistically.

⁶¹ Notice that this issue would not arise in an intensional system like Vostrikova’s. But since we use explicit time variables rather than implicit time parameters, we need a Temporal Shift Together rule that make sure ‘then’ and the present are not evaluated with respect to different time variables.

Appendix C: A puzzle about future-under-future

In this Appendix, we consider a potential extension of the SOT rule to future tense in MG, which is unattested in other SOT languages. Surprisingly, based on MG data we present, it seems that present- and future-under-future may be used to trigger the simultaneous reading.

C.1. Future in English and in French

Notice that under future tense all tenses can be shifted, included the present tense in English (Abusch, 1998). Therefore, a present-under-future sentence has the simultaneous reading and a future-under-future one the so called ‘forward-shifted’ reading. In other words, the embedded future refers to a time later than the matrix one. This is illustrated in the following English and French sentences:

- (128) Tomorrow Biden will say that he is in a good hospital
(129) Tomorrow Biden will say that he will be in a good hospital

The first sentence only has the simultaneous reading, i.e., Biden will say ‘I am in a good hospital’. The second sentence only has the forward-shifted reading, i.e., Biden will say ‘I will be in a good hospital’ (some time after tomorrow). The same holds for the following French sentences:⁶²

- (130) Demain Biden visitera un hôpital militaire, et il dira qu’il est
Tomorrow Biden visit-FUT a hospital military, and he say-FUT that-he be-PRES
dans un excellent hôpital.
in an excellent hospital
‘Tomorrow, Biden will visit a military hospital, and he will say that he is in an excellent hospital’
- (131) Demain Biden visitera un hôpital militaire, et il dira qu’il sera
Tomorrow Biden visit-FUT a hospital military, and he say-FUT that-he be-FUT
dans un excellent hôpital.
in an excellent hospital
‘Tomorrow, Biden will visit a military hospital, and he will say that he will be in an excellent hospital’

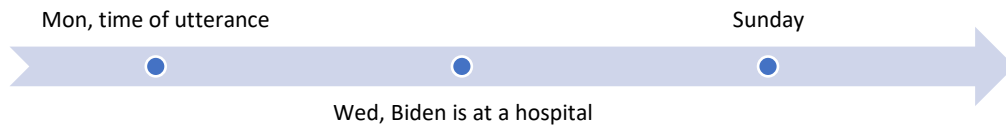
Again, the first sentence only has the simultaneous reading, and the second sentence only has the forward-shifted one. Therefore, it seems that in English as well as in French a future-under-future sentence cannot trigger a simultaneous reading.

What happens with future tense in MG? Is there an agreement rule when the main verb is in the future (i.e., is the second future deleted) or is every embedded future semantically interpreted yielding a forward-shifted reading? Based on English and French and given that MG has an SOT rule like these languages, we would expect that MG future-under-future only has a forward-shifted reading as well. What is more, the SOT rule is specific to past tense attitude verbs, thus not applying to tenses under future. Even at the absence of an SOT rule for the future, however, why can’t we derive a simultaneous reading by an embedded future read *de re*? *Prefer Local Binding* could explain this, since a structurally *de se* LF would be preferred over a *de re* one. At the absence of an agreement rule, we would have to semantically interpret the second future. Therefore, when we have an embedded future, only the forward-shifted reading is possible, namely that Biden will say ‘I will be in a good hospital’.

⁶² We thank Philippe and Victor for the judgments.

However, this does not explain why it is also impossible to utter the following sentence in English under the meaning that Trump will say on Sunday ‘I was in a good hospital on Wednesday’⁶³:

(132) #Biden will say on Sunday that he will be in a good hospital on Wednesday.



This should not be ruled out by *Prefer Local Binding* and is yet infelicitous under the intended meaning. Consequently, a different explanation may be needed to rule out future-under-future simultaneous readings in English. We leave this open for future research.

C.2. Future in Modern Greek

Surprisingly, we claim that in MG future-under-future can yield simultaneous readings. The MG version of (128) and (129) with future-under-future would have the simultaneous reading, unlike English and French. An agreement rule or a *de re* reading the future may need to be posited to account for this. In general, SOT rules are expected to arise in attitude reports under past, but not under future. That is, the embedded future should be semantically interpreted, triggering a forward-shifted reading. Yet, this is not necessarily the case in MG:

(133) Avrio o Biden tha pi oti ine se ena ekseretiko nosokomio.
Tomorrow the Biden will say that be-PRS in a excellent hospital.
 ‘Tomorrow Biden will say that he is in an excellent hospital’

(134) Avrio o Biden tha pi oti tha ine se ena ekseretiko nosokomio.
Tomorrow the Biden will say that will be-PRS in a excellent hospital.
 Literally: ‘Tomorrow Biden will say that he will be in an excellent hospital’

The future-under-future sentence in MG can have the simultaneous reading too. This is also illustrated by the following example:

(135) Meta tis epomenes ekloghes, o kenurios proedros tha pi ston amerikaniko lao
After the next elections, the new president will say to-the American people
oti tha ine o arkhghos enos dichasmenu ethnos.
that will be the leader from-one divided nation
 ‘After the next election the new president will tell the American people that he is (literally: will be) the leader of a divided nation’

This sentence has the simultaneous reading, meaning that the new president will say ‘I *am* the leader of a divided nation’. It could have the forward-shifted reading too, but it would need to be forced by the context or a temporal phrase like ‘epita’ (afterwards). The simultaneous reading can of course also be triggered by a present-under-future, like in English, so there are two roads to the simultaneous reading once again. It should also be noted that there is not complete optionality, but a slight preference for present-under-future is observed, although this may be because the future-under-future sentence also contains the particle ‘tha’ (will) and is thus more complex.

⁶³ This remark as well as example (132) are due to Benjamin Spector.

The simultaneous reading with present-under-future is expected, since MG present tense is shiftable and, in any case, tenses generally shift under future. But how do we explain the simultaneous reading of future-under-future? Could it be that there is an agreement rule, and the second future is only morphologically there, while being semantically deleted, just like past-under-past? Or is the second future interpreted *de re*?

As far as future-under-future in relative clauses is concerned, the English pattern would lead us to expect optionality. Indeed, this is what we observe:

- (136) *Meta tis epomenes ekloghes, o kenurios proedros tha di enan lao pu*
After the next elections, the new president will see a people who
 (tha) *vriskete sta profira emfiliu polemu.*
(will) find-PRS to-the edge civil war
 'After the next election, the new president will see a people who will be/is at the verge of a civil war'

Both present- and future-under-future have the simultaneous reading. Indeed, this is also possible in English. Yet, we have said that in English the present tense cannot shift, while in Greek/Russian/Hebrew it shifts whenever an attitude verb shifts the local 'now'. How can the present really be indexical in English if the following does *not* have the meaning 'John will meet a woman who loves him *now*'?

- (137) Michael will meet a woman who loves him.

This can be accounted by the fact that tenses generally shift under future, since as Abusch (1998) argues 'will' behaves like an attitude operator, shifting the local 'now'. We may therefore either say that the English present tense is not *always* indexical, being shifted by 'will', or follow Schlenker (1999) and argue that 'will' morphologically transmits present tense features that are not semantically interpreted⁶⁴.

Interestingly, the optionality regarding present- or future-under-future observed under attitude verbs could simply be a lexical fact of the particle 'tha' (will), since it is not replicated with 'prokita na' (be going to):

- (138) #*O proedros tha pi avrio se ena kanali oti prokita na ine se ena nosokomio.*
The president will say tomorrow to a channel that is-going to be to a hospital
 'The president will say to a channel tomorrow that he is going to be in a hospital'

The only possible reading of this sentence is a forward-shifted reading (just like we would expect in English and in French), which is ruled out by the context. Therefore, (138) would only be acceptable with present-under-future.

All in all, the MG data about the future are very puzzling. The SOT rule is only expected to arise in attitudinal environments where the matrix verb is in past tense. Why would we get a simultaneous future-under-future reading? In Abusch's theory 'will' behaves like an attitudinal operator, binding t_0 . Why would such an operator not bind t_0 in MG when embedded? It could be that MG, unlike other SOT languages, has an SOT rule operating in all attitudinal environments, including 'will'. If so, what makes this unavailable in English and French? We leave these questions open for future research.

⁶⁴ Following Schlenker, 'loves' would be 'love- \emptyset ', since present tense features would semantically be deleted. Given that the past is analyzed as past of a present in Schlenker's system, this commits us to the past tense being shiftable as well, as in 'In 10 years, John will work with someone who studied with him'. The past tense in 'studied' need not be in *our* past, but in John's past (10 years from now). This seems to be a correct prediction.

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