Structural difference and difficulty in translation and interpretation

Short version of draft PhD thesis

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Contents

Abstract

Is structural difference in a language pair associated with difficulty in translating or interpreting complex sentences in that pair? This study aims to shed light on that question. Specifically, it seeks associations between typological differences in the branching direction of subordinate clauses and rates for three identified indicators of production difficulty in translation or interpretation. The unit of analysis used to measure rates for those indicators is the semantic proposition. The analysis involves translation or interpretation from English into five languages from different families: Russian, Hungarian, Turkish, Mandarin and Japanese. Three modes of language transfer are considered: legal translation, subtitle translation and simultaneous interpretation. The findings provide initial confirmation that greater structural difference in a language pair is associated with higher rates for indicators of difficulty in translation or interpretation in that pair, with some major differences between the three modes considered.

1. Introduction

Many factors can contribute to the difficulty of a translation or interpretation task. Some of those factors can have to do with the text or speech – like subject, terms, idioms, register, style or (for interpretation) speed. Others can have to do with the translator or interpreter – like experience, background knowledge, personal beliefs, or physical or emotional state. The task can be made more difficult by cultural differences – like history, politics, popular references or norms of politeness. The same is true of linguistic features – like writing systems, morphology, irregularity, grammatical ambiguity or homophony.

But there's another major factor of difficulty which can often be underestimated: **structural difference** in the language pair of translation or interpretation – especially large-scale typological difference in the branching direction of subordinate clauses. This study seeks associations between that typological difference and three identified indicators of production difficulty in translation and interpretation. It counts the average rate for each indicator in a corpus of more than 1000 English sentences, each translated or interpreted into five languages from different families: **Russian, Hungarian, Turkish, Mandarin** and **Japanese**. It then seeks associations between those rates and the structural difference of each language pair.

Each indicator of difficulty involves relations between **propositions**. A proposition is the semantic relation underlying a syntactic clause. The proposition is a good unit for cross-linguistic comparison, because an event or situation can be described in different syntactic forms in different languages. This study uses the proposition as a unit of analysis to count rates for three features of translation or interpretation identified as indicators of difficulty: **reordering, nesting changes** and **changes in semantic relations**.

The study doesn't claim to measure the level of difficulty in a given translation or interpretation task. But it does assume that, if reordering, nesting changes and changes in semantic relations are accepted as indicators of some degree of production difficulty, then, in a given sentence, a higher count for any of those indicators in one language pair suggests a greater degree of difficulty than a lower count for the same indicator in another language pair.

The sentences examined are from three modes of language transfer: **legal translation, subtitle translation** and **simultaneous interpretation**. For legal translation, I analyze translations of the Universal Declaration of Human Rights, the Paris Agreement on climate change and the US Foreign Corrupt Practices Act. For subtitle translation, I analyze translated

subtitles for the five most popular TED talks to date. For simultaneous interpretation, I analyze recorded interpretation of President Obama's 2015 speech to the UN General Assembly.

The statistical analysis reveals strong associations between three independent variables – structural difference, mode of transfer and sentence complexity – and three dependent variables – the indicators of difficulty mentioned above.

Taken together, the findings of the study suggest that, the more a language pair differs in structure, the more difficult it may be to translate or interpret a complex sentence in that pair, and the more the meaning may be changed – with some major differences between the three modes of transfer considered.

2. Structural difference and difficulty

2.1 The branching direction of subordinate clauses

Two attached clauses can be in a relation of syntactic coordination or subordination. There are three broad categories of subordinate clause generally investigated cross-linguistically: relative, complement and adverbial clauses (Gast and Diessel 2012: 1).

A typology of languages in terms of the typical branching direction of relative clauses is given by Dryer (2013) in the World Atlas of Language Structures. Dryer (2007) also provides a typology of languages in terms of the typical branching direction of relative and adverbial clauses. Schmidtke-Bode and Diessel (2017) classify languages in terms of the typical branching direction of complement clauses. Diessel (2001) does the same for the typical branching direction of adverbial clauses.

According to the above classifications, Indo-European and Semitic languages are in one group, with typically right-branching relative and complement clauses, and adverbial clauses which typically branch either way. Finno-Ugric languages are in a second group, with typically right-branching complement clauses and relative and adverbial clauses which typically branch either way. Sino-Tibetan languages are in a third group, with typically right-branching complement clauses and typically left-branching relative and adverbial clauses. Other languages, like Japanese, Korean and Turkish, are in a fourth group, with typically left-branching structures for all three major types of subordinate clause.

Following the typological classifications cited above, Table 1 shows the typical branching direction of the three major types of subordinate clause, in the six languages considered in this study.

Table 1
Typical branching direction of subordinate clauses

Language	Relative clause	Complement clause	Adverbial clause
English	right	right	either
Russian	right	right	either
Hungarian	either	right	either
Turkish	left	left	left
Mandarin	left	right	left
Japanese	left	left	left

2.2 Structural difference and difficulty in translation

Translators who work between languages with very different structure can perceive that difference as a major source of production difficulty, independently of the processing difficulty associated with a given text. That perception is supported by a growing body of research.

Some of that research involves translation between different European languages. Experiments reported by Vanroy (2021: 155) associate linear and hierarchical differences in corresponding word groups with difficulty in English-to-Dutch translation, concluding that "diverging syntactic properties between a source and target unit cause increased translation difficulty." In studies of translation from English into Danish, German and Spanish, Bangalore et al. (2015; 2016) find that differently ordered syntax is associated with higher cognitive load, as reflected in reading time per source word, response time and total translation time.

Other analyses of translation difficulty involve translation between European and Asian languages. Carl and Schaeffer (2017: 55) find much higher degrees of syntactic variation between English and Japanese or Hindi than between English and Danish, Spanish or German, which they say makes the translation process much "more difficult and time-consuming." Zou (2016: 190) finds that the most difficult aspect of English-Mandarin translation is the translation of long, complex sentences, due to "difference in phrases and sentence structures." In a study involving Mandarin and seven European langugages, Wong (2006: 124) concludes that "translating between the European languages is much easier than translating between Chinese and any one of the European languages," with structural difference being a greater factor of difficulty than differences in vocabulary or culture. In his view, "this is because the translator is, during the translation process, constantly dealing with syntax in two directions: the syntax of the source language on the one hand and the syntax of the target language on the other."

2.3 Structural difference and difficulty in interpretation

Difficulty associated with structural difference between languages has been an increasing topic of research into simultaneous interpretation, because of the added burden which some authors see structural difference as placing on an interpreter's working memory.

Nowhere is that difficulty more strongly questioned than in Seleskovitch and Lederer's (1989) influential *théorie du sens* or interpretive theory. Central to that theory is the notion of "deverbalizing" – processing a message through a language-free stage between understanding and reformulation. The interpretive theory maintains that simultaneous interpretation "hardly differs from one language pair to the next" (p. 137). That view is supported by pointing to interpretation between German and other European languages: "The success of simultaneous interpretation [from German into French] shows the validity of the interpretive method applied to a syntactically very different language pair" (p. 149).

The interpretive theory maintains that observations of interpretation between languages like English, French and German can be extrapolated to interpretation in any language pair. But other researchers disagree. They argue that major differences in the linear order of clauses may make complex sentences in some language pairs resistant to structurally accurate and coherent translation or interpretation. It's this aspect of discourse, the "constraint of linearity," which, in their view, the interpretive theory disregards (Gumul and Łyda 2007; Shlesinger 2014).

In that view, non-linguistic processing, though useful as a conceptual tip for interpreters, may not be able to obviate major differences in the order in which information is presented in a sentence, especially if the sentence has many subordinate clauses. Chomsky (2003) sees the clause as constituting a unit of logical processing, or "phase." In a study of interpreters' ability to recall the form of a sentence they've just interpreted, Isham (1994: 195) finds that interpreters have a greater tendency to process information clause by clause than sentence by sentence, suggesting that "interpreters use the clause as their default unit of processing."

Setton (1993: 238) is critical of the interpretive theory, which he says has come in for increasing criticism, "especially from the Japanese sphere.… Apart from … the perceived 'naively empirical' nature of the theory, … cultural and linguistic factors are … swept aside by (largely … uninformed) dogma in support of the theory's universality." Setton (1999: 54) says: "Outside the [interpretive theory], almost all writers […] with the relevant experience consider [interpretation from a left-branching language into a right-branching one] to present particular problems." Setton and Motta (2007: 205) consider that "the famous notion of

'deverbalization' … has never been formulated with enough precision to satisfy everybody, or perhaps to be properly tested." According to Gile (2009: 198), "while the relevance of language-specificity in interpreting has not been demonstrated empirically, arguments in favour of the hypothesis are strong," especially due to "syntactic differences between the source language and the target language in simultaneous interpreting."

As explained above, German is typologically similar to other Indo-European languages in terms of the typical branching direction of subordinate clauses. Despite this large-scale structural similarity, many studies explore specific difficulties associated with interpretation between German and other European languages.

In an overview of German-English simultaneous interpretation, Wilss (1978: 343) suggests that "languages with predominantly parallel syntactic patterning, e.g. English and French, demand less syntactic restructuring than do languages which differ considerably in structure, e.g. German and English," concluding that "transfer on the basis of parallel syntactic structures can […] be regarded as easier to accomplish." In a study of German-to-English interpretation, Seeber and Kerzel (2012: 238) find that "cognitive load during simultaneous interpreting of syntactically asymmetrical structures increased. These results are at odds with a universalist view of interpreting, according to which structural differences of the languages involved are irrelevant to the process."

The works cited above suggest that simultaneous interpretation of comparable speeches may be more difficult in language pairs like English-German, Italian-German or English-Arabic than in language pairs like English-Italian or English-French, for reasons specific to the structural difference of those language pairs. But that structural difference mostly involves the order of elements within a clause. So it operates on a more local scale than the major differences which divide languages like Indo-European and Semitic ones from languages in several other families in terms of the typical branching direction of subordinate clauses. If local differences in the internal structure of a clause may be associated with increased production difficulty in translation or interpretation, as suggested in the above studies, it seems reasonable to expect that much larger-scale typological differences may be associated with greater degrees of production difficulty.

To date, little empirical research has been done on difficulty associated with structural difference in simultaneous interpretation between languages with major differences in complex sentence structure.

Gile (2011: 34) reports on a comparative study analyzing interpretation of an English speech into French, German and Japanese. He finds that "there were more errors and omissions in the Japanese renderings than in either the German or French renderings," concluding that this is "consistent with the tightrope hypothesis, according to which interpreters tend to work close to cognitive saturation, which also makes language-specific and language-pair-specific idiosyncrasies relevant parameters in the interpreting process."

Ahn (2005) finds that complex sentences can't be interpreted with sustained accuracy and coherence from Korean into English, analyzing two types of syntactic management strategy which distort "perspective coherence."

In a study of English-Mandarin interpretation, Wang and Gu (2016) find a high frequency of unnatural pauses, errors and inaccuracies, which they see as indicators of difficulty associated with "structural asymmetry" in that language pair.

3. Indicators of difficulty in translation or interpretation

This study identifies three features as indicators of difficulty in translation or interpretation – reordering, nesting changes and changes in semantic relations. Each of those features involves the linear or hierarchical relations between propositions. A proposition refers here to the set of relations among entities in an event or situation established by a logical function – a predicate.

One dimension in which the arrangement of propositions can change is horizontal: with changes in their linear order or changes in structures where one proposition is nested inside another. The other dimension in which the arrangement of propositions can change is vertical: with hierarchical changes in the way one proposition is subordinated to another.

3.1 Reordering

"Reordering" in this study means reordering of propositions: a translator or interpreter's need or choice to move a proposition from where it was in the original version of a sentence to an earlier or later place in translation or interpretation, in relation to the other propositions.

Suppose a Japanese translator is translating the Universal Declaration of Human Rights from English into Japanese. Structural or stylistic differences between the two languages may lead them to change the order of propositions in a sentence, as illustrated in Figure 1. (Lines connect corresponding propositions in each version of the sentence. Several English propositions are split apart in Japanese.)

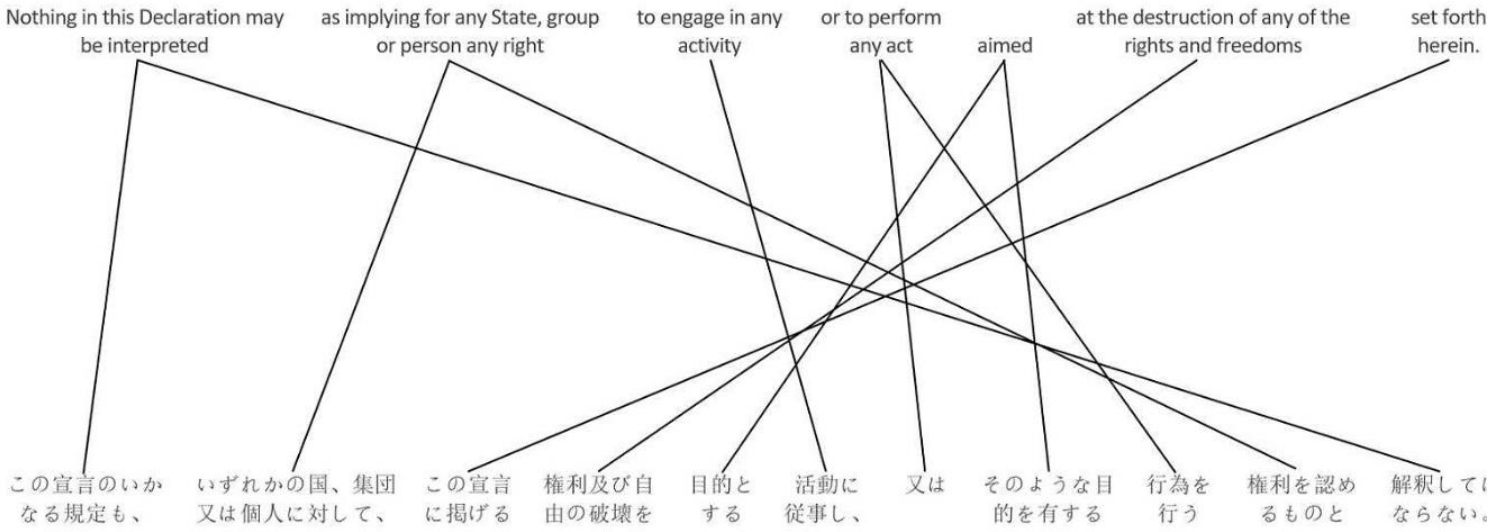


Figure 1
Universal Declaration of Human Rights, last sentence, English and Japanese versions

To produce a result like the Japanese translation in Figure 1, the translator would have to read through the entire English version of the sentence, understanding its seven propositions and the relations between them, before deciding which part of which one to translate first. After translating each part, they'd have to re-examine the remaining parts of the English version and the relations between them, before deciding which one to translate next. In contrast, a translator working into a language with similar complex sentence structure to English could begin translating the sentence as soon as they'd read the first proposition, then go on to the next one and so on, without having to recall or reread the rest of the sentence each time.

The problem can be even greater in simultaneous interpretation. An interpreter hearing the English version of the sentence in Figure 1 without a written copy would be unlikely to produce such a nicely reordered result as the cited Japanese translation in real time, because of the great burden that could place on their working memory. To do so, they'd have to wait till they'd heard the end of the English version, retaining seven different propositions and the relations between them, before deciding which part of which one to interpret first. After interpreting each part, they couldn't reread the sentence like a translator could. So they'd have to try to recall the remaining parts of the sentence and the relations between them before deciding which one to interpret next. To achieve a more manageable cognitive burden, they'd probably produce a result with less reordering, less nesting and therefore less structural accuracy. The more parts of a complex sentence an interpreter tries to retain and juggle around, the more difficult their task becomes.

Several studies have shown reverse recall of verbal information to be more difficult than forward recall. Donolato, Giofrè and Mammarella's (2017) review of literature on the subject concludes: "In verbal span tasks, performance is worse when recalling things in backward sequence rather than the original forward sequence." Similarly, experiments by Anders and Lillyquist (2013) and by Thomas et al. (2003) find reverse recall of information to be much slower than forward recall. Not to mention the difficulty of recalling reordered bits of split propositions.

The more the order of propositions changes from source to target language in translation or interpretation, the more the task of recalling them approaches totally reverse recall and, according to the above findings, the more difficult that task becomes. Schaeffer and Carl (2014) propose parallel word order as a criterion for "literal translation," which they find to be associated with lower cognitive load than "non-literal" solutions in English-to-Spanish translation. Birch et al. (2008) find reordering to be a strong predictor of translation "difficulty" as reflected in the performance of statistical machine translation engines.

In studies of translation from English into Danish, German and Spanish, Bangalore et al. (2015; 2016) find differently ordered syntax to be associated with an increase in cognitive load. Experiments reported by Vanroy (2021: 155) associate linear and hierarchical differences in corresponding word groups with difficulty in English-to-Dutch translation. He also proposes a tool for predicting the translation difficulty of a sentence based on various features of the language pair of translation, including the need for reordering.

3.2 Nesting changes

A "nesting" in this study means a structure where one proposition is syntactically surrounded by the predicate and arguments of another proposition. An example of a nesting in English is the sentence "The cat *the dog was chasing* ran up the tree."

In a language with typically left-branching structure, like Japanese or Turkish, a clause or other phrase expressing a proposition generally has its subject near the beginning and its predicate in final position. So a complex sentence in a language like that can have more nestings than a comparable sentence in a language with typically right-branching structure, like a European one. This tendency towards nesting in a left-branching language can be particularly strong in formal speech and even stronger in formal writing, where long, complex sentences can be common.

The higher nesting rate that can characterize formal writing in a left-branching language, or in a language with mixed branching structure, may be compounded in translation from a right-branching language. For example, Figure 2 shows a parse tree of the propositions in an English sentence from a 2016 article by A. Hill in the *Financial Times*.

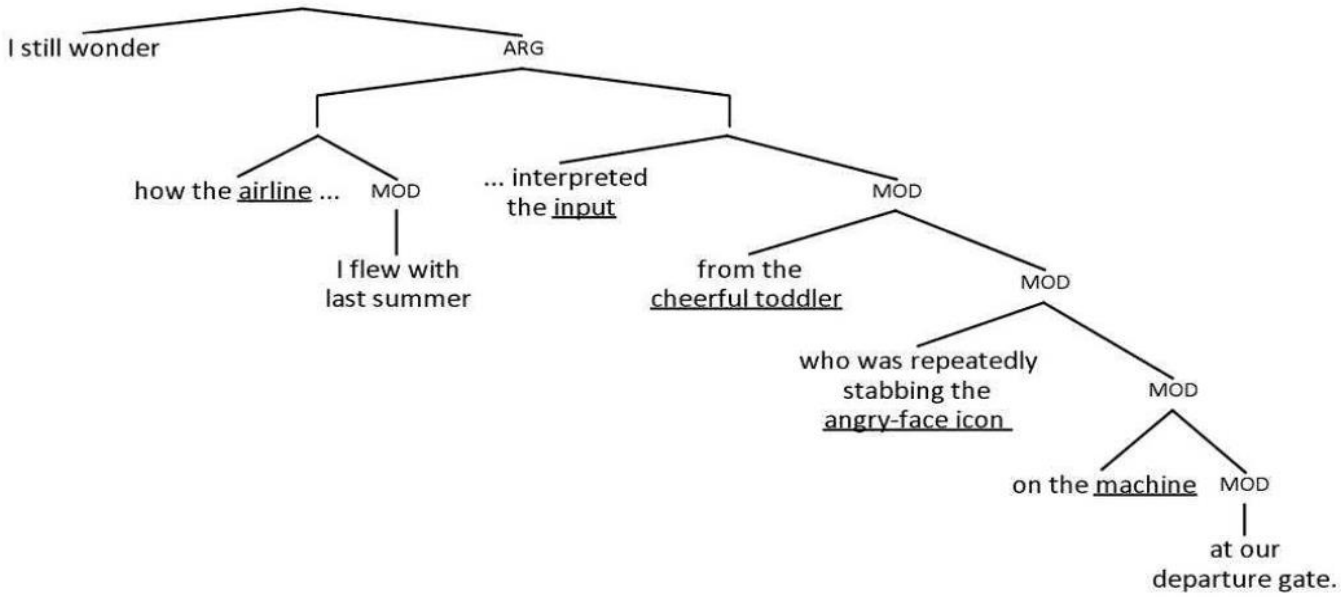


Figure 2
Original English version of sentence

But the same sentence from the article as it appeared in Mandarin translation in the *Financial Times Chinese* has several syntactically split propositions, with parts which stay unresolved over long distances, as illustrated in Figure 3. The numbers show the order the branches need to be read in to make sense in English.

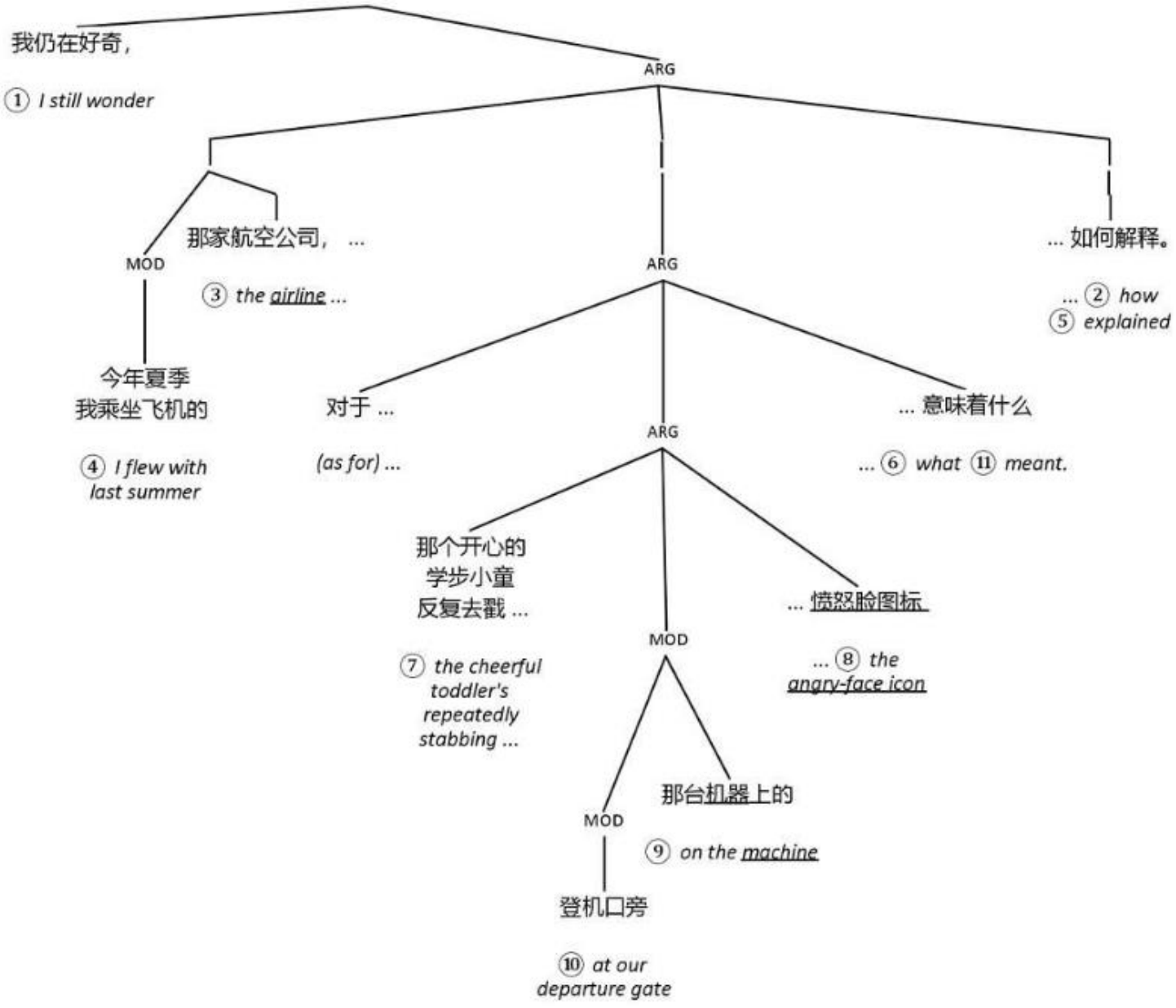


Figure 3
Mandarin translation of sentence

The original English version of the sentence in Figure 2 is easy enough to process. But the Mandarin translation in Figure 3, though structurally accurate, is much harder to process, because of the multiple nestings. Mandarin translations of foreign publications can be full of this sort of unwieldy structure. This may be because the translators are careful to preserve the structure of the original text. If they're translating an official text, they may feel under even more pressure to be precise. And they – or their supervisors or editors – may be unaware of or unconcerned by the trade-off between structural accuracy and processing difficulty illustrated in this example.

Hawkins (2014) posits a number of universal efficiency principles of the human language faculty, including a preference for minimal phrasal combination domains (PCDs). A PCD is defined as the smallest linear string required by the human syntax processor to link a phrase head to a directly subordinate constituent. A universal tendency towards minimal PCDs is reflected in studies of grammaticalized phrase order preferences across languages, including studies by Greenberg (1963) and Dryer (1992). This tendency has been confirmed in corpus research and several tests of subjective phrase order preferences. Those tests have involved right-branching languages like English (Hawkins 2000), left-branching languages like Japanese and Korean (Hawkins 1994; Yamashita and Chang 2001, 2006; Choi 2007) and languages with mixed branching direction like Cantonese (Matthews and Yeung 2001). In all languages and for all phrase types tested, the evidence indicates that "processing becomes harder, the more items are held and operated on simultaneously when reaching any one parsing decision," and that "processing complexity and difficulty increase as the size and complexity of the different processing domains increase" (Hawkins 2014: 47).

Karlsson's (2006: 2) study on center-embedding (nested clauses) in various languages finds that "multiple clausal center-embedding is not a central design feature of language in use" and that "the maximal degree of center-embedding in written language is three." Quirk et al. (1989: 1040) consider even doubly nested clauses to be ungrammatical and "completely baffling." Karlsson's study involves European languages, but he suggests that "it nevertheless seems reasonable to assume a more general validity." In his view, constraints on nested clauses "have their ultimate basis in the material language-processing resources and limitations of the human organism […] especially short-term memory limitations."

As we've seen, the number and degree of nested propositions in a sentence is a factor of processing difficulty. But creating or eliminating a nested structure in translation or interpretation is a factor of production difficulty as well. If the original version of a sentence has a non-nested proposition and the corresponding proposition in translation or interpretation is placed in a nested structure, the transformation involves splitting the

surrounding proposition. On the other hand, if the original version of a sentence has a nested proposition, the translator or interpreter may need or may choose to repackage the message in such a way that one proposition no longer splits the other. Eliminating a nesting in that way, like creating a nesting, is likely to involve extra mental effort, as both transformations involve reordering the predicate and arguments of the parent proposition.

3.3 Changes in semantic relations

A "semantic relation" in this study means the place and type of attachment of a subordinate proposition – in other words, which parent it's directly attached to and its semantic role in relation to that parent. For example, consider the sentence "Answer the questions on the board." Pragmatic knowledge suggests that the phrase "*on the board*" is meant to be taken as a modifier of the noun "questions." But that phrase might instead be translated or interpreted in another language as an adjunct to the predicate "answer." So the translated or interpreted sentence would end up meaning "Answer the questions (and write your answers) *on the board*."

A translated or interpreted version of a complex sentence which changes the hierarchical relations between propositions in the original version isn't necessarily wrong. It just means that the propositions in question aren't attached in the same ways in both versions of the sentence. The fact that a translator or interpreter made such a change suggests that they were for some reason unable to reproduce or uncomfortable reproducing the original semantic relations. Whatever the reason, the fact that such a change was made is taken here as an indication that the translator or interpreter encountered some sort of difficulty that led them to do so, rather than reproducing the hierarchical structure of the original.

Taking reordering and nesting changes as indicators of difficulty in translation or interpretation is justified empirically, as we've seen. The case for taking changes in semantic relations as an indicator of difficulty is more pragmatic. When a group of propositions attached in one way in the original version of a sentence is isolated and contrasted with the same propositions attached in a different way in translation or interpretation, it's generally clear that the meaning is different in that respect.

When dealing with a short sentence, a good translator or interpreter would be unlikely to make such an obvious mistake as the example given above about writing answers on the board. But in long, complex sentences like those characteristic of legal texts, especially if the translator or interpreter isn't familiar with the details or the larger context, alternative

readings of the relations between propositions can be common. And failure to reproduce those relations as originally intended can have major consequences.

Experiments reported by Vanroy (2021) find a significant association between changes in dependency relations among syntactic constituents and translation difficulty. The author discusses various ways of measuring the syntactic equivalence of a source and target text, which he sees as consisting in a combination of reordering, changes in dependency roles and changes in dependency relations. He concludes that such changes make the translation process more difficult.

Larson's (1984) guide to translation technique uses the same unit of analysis as this study – the semantic proposition. She sees reproduction of the semantic relations within and between propositions, regardless of syntactic form, as key to the preservation of meaning in a successful translation. Accordingly, a change in semantic relations in translation or interpretation can be taken as a sign that the translator or interpreter has encountered some sort of difficulty that has prevented them from reproducing the original relations among propositions in the target language.

4. Corpus

4.1 Legal translation

As a genre of standard written translation, this study has chosen to focus on **legal translation**, as opposed to other genres such as literature or magazine articles. One reason for this choice is that legal texts often have long, complex sentences, which is where the translation difficulties highlighted in this study are most likely to appear. Another reason is that, in addition to difficulty in the translation process, output-related issues, such as distortions of meaning or coherence and comprehension difficulty for the reader, can have major consequences in legal translation.

Within the category of legal translation, three major international documents are analyzed: the **Universal Declaration of Human Rights**, the **Paris Agreement on climate change** and the **US Foreign Corrupt Practices Act**.

4.2 Subtitle translation

For **subtitle translation**, this study has chosen to analyze five different TED talks, as opposed to other types of subtitle translation, such as translation of subtitles for films or entertainment series. The reason for this choice is that other types of subtitle translation tend to involve a lot of dialogue consisting of simple sentences, where the translation difficulties highlighted here are unlikely to appear. In contrast, lectures by single speakers who are experts in their fields tend to have more complex sentences. Among online lecture platforms, TED is probably the most widely watched, with hundreds of millions of views.

Because of their large global reach, the choice has been made to analyze the five most popular TED talks to date, according to the website for the most popular TED talks of all time. The five talks used in this study are: “Do schools kill creativity?” by **Sir Ken Robinson**, “Your body language may shape who you are” by **Amy Cuddy**, “How great leaders inspire action” by **Simon Sinek**, “The power of vulnerability” by **Brené Brown** and “Inside the mind of a master procrastinator” by **Tim Urban**.

4.3 Simultaneous interpretation

As a genre of interpretation, this study has chosen to focus on **simultaneous interpretation**, as opposed to other forms of spoken interpretation such as consecutive, liaison, community or telephone interpretation. The main reason for this choice is that the working memory constraints which can have a major effect on the linear order and hierarchical structure of complex sentences, particularly in language pairs where subordinate clauses branch in opposite directions, are most prevalent in simultaneous interpretation.

Within the category of simultaneous interpretation, this study has chosen to analyze recordings of interpretation of former **US President Barack Obama's speech to the UN General Assembly** on 28 September 2015. One reason for choosing to analyze a speech to the UN is that organization's unique international scope. Another reason is that three of the languages considered here – English, Russian and Mandarin – are official UN languages, so sessions of the General Assembly are interpreted simultaneously into those languages by expert UN staff interpreters.

Recordings of the original English speech and of the Russian and Mandarin interpretation were obtained with permission from the UN Audiovisual Library. Interpretation into Hungarian, Turkish and Japanese was kindly provided and recorded by expert freelance interpreters for this study. All five interpreters were working with a written copy of the original speech provided shortly beforehand, but without a prepared written translation.

5. Statistical analysis

This study analyzes 1,136 sentences, in the three modes of language transfer mentioned above. For each sentence, the semantic structure of the original English version is compared to that of its translation or interpretation into five languages from different families – Russian, Hungarian, Turkish, Mandarin and Japanese.

The analysis included **three independent variables**. The first independent variable was **mode of language transfer** (legal translation, subtitle translation or simultaneous interpretation). The second independent variable was **structural difference of the language pair**, referring to differences in the branching direction of subordinate clauses. The third independent variable was **sentence complexity**, referring to the number of functionally subordinate propositions in the original English version of a sentence. (A functionally subordinate proposition is one which doesn't make an assertion and can't be rephrased as an independent sentence.)

The statistical analysis also included **three dependent variables**, recorded separately for each translated or interpreted version of a sentence. Those dependent variables were counts for the three features identified as indicators of difficulty in translation or interpretation – **reordering**, **nesting changes** and **changes in semantic relations**. Counts for nesting changes were subdivided into counts for changes in single nestings and double nestings.

The analysis first produced descriptive statistics reflecting the value of each dependent variable corresponding to each pair of independent variables as observed in the corpus data. On that basis, predictions were made using a generalized linear mixed-effects model for each dependent variable. The models were estimated using the glmmTMB package for the R computing environment. The estimated models were used to predict the mean response of each dependent variable to the three independent variables. If our corpus is considered representative, those predictions can be generalized to other similar texts and speeches.

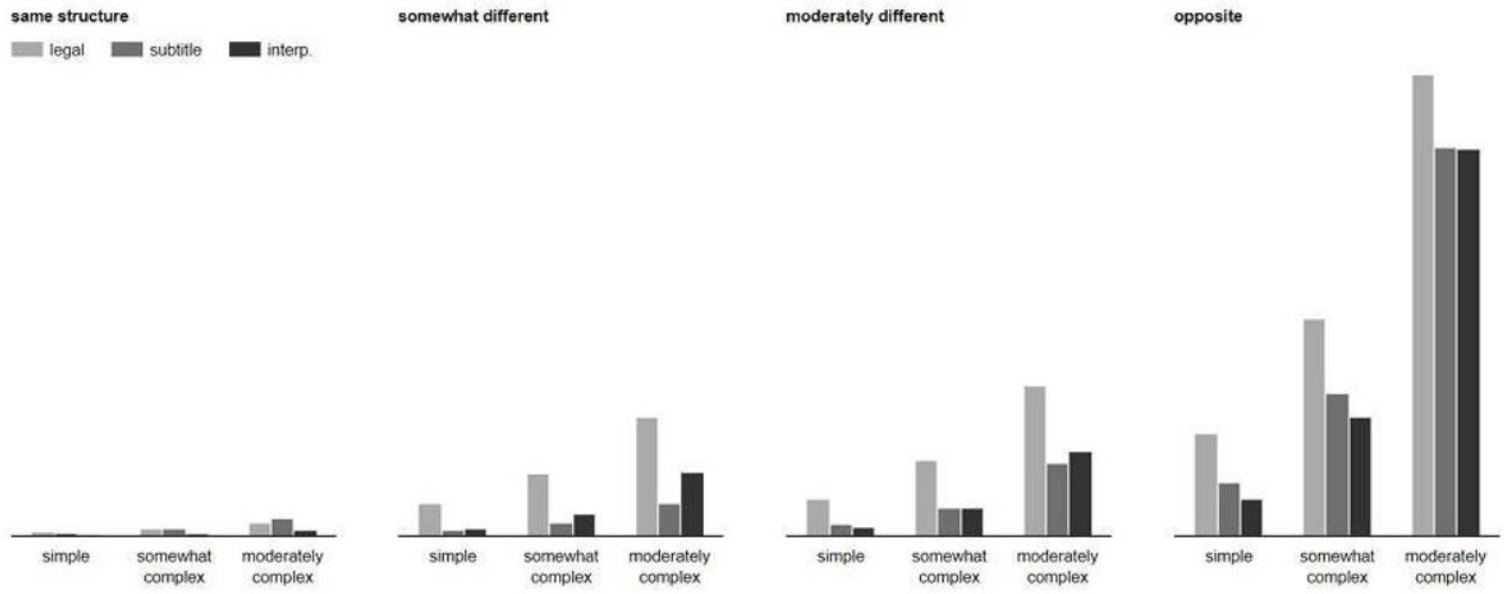
6. Results

The first step in the predictive analysis was to check for significant interactions between our three independent variables – mode, structural difference and sentence complexity. To do that, the p-value, or chance of randomness, was computed for the three pairwise interactions between those variables. Each pairwise interaction between mode, structural difference and sentence complexity yielded a p-value of less than 0.05 and can therefore be regarded as significant for all three indicators of difficulty. In other words, each independent variable interacts significantly with the other two. So our statistical tests predicted the combined effect of all three independent variables on each indicator of difficulty.

Let's start with the combined effect of those independent variables on **reordering**. The predicted mean rates of reordering per sentence are visualized in **Chart 1**.

Chart 1

Predicted mean rates of **reordering** per sentence corresponding to interactions between **structural difference, sentence complexity** and **mode**



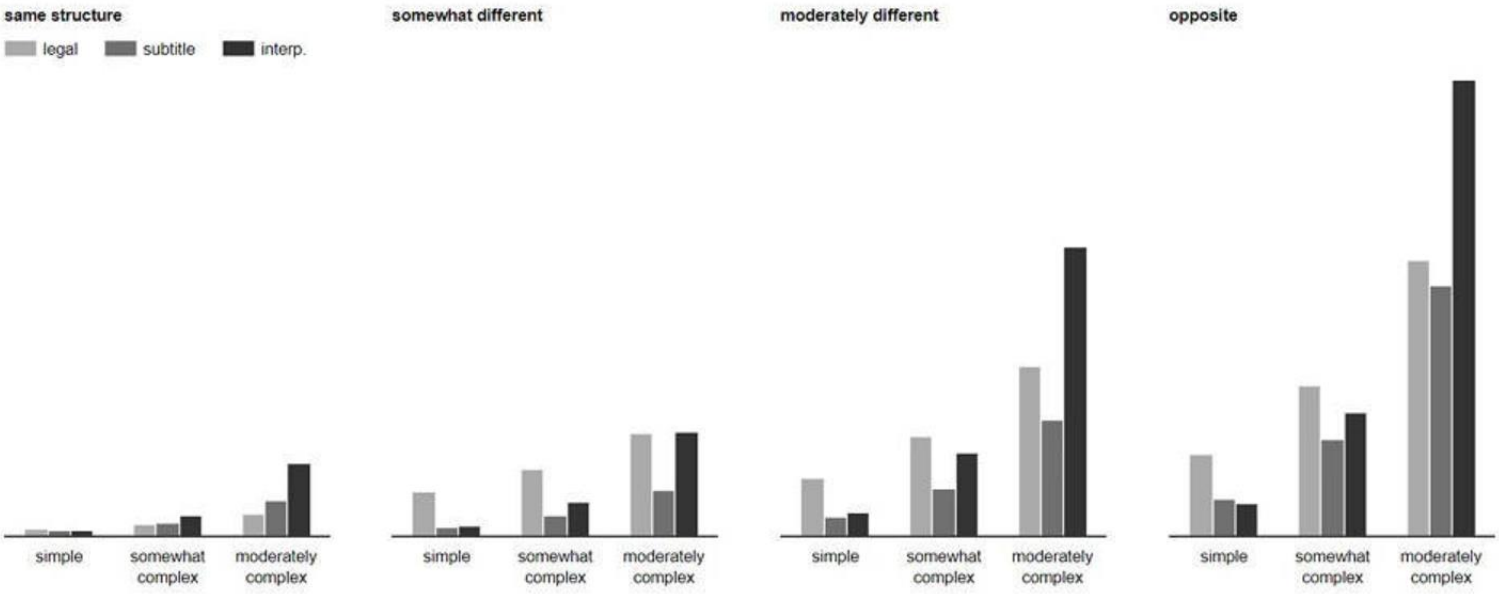
simple: sentence with 3 functionally subordinate propositions / somewhat complex: 6 / moderately complex: 9

Reordering: predicted to increase greatly with **structural difference** and **sentence complexity** – a bit more in **legal translation** than in the other modes

Let's look next at the combined effect of the independent variables on **changes in single nestings**. The predicted mean rates of changes in single nestings per sentence are visualized in **Chart 2**.

Chart 2

Predicted mean rates of **changes in single nestings** per sentence corresponding to interactions between **structural difference, sentence complexity** and **mode**

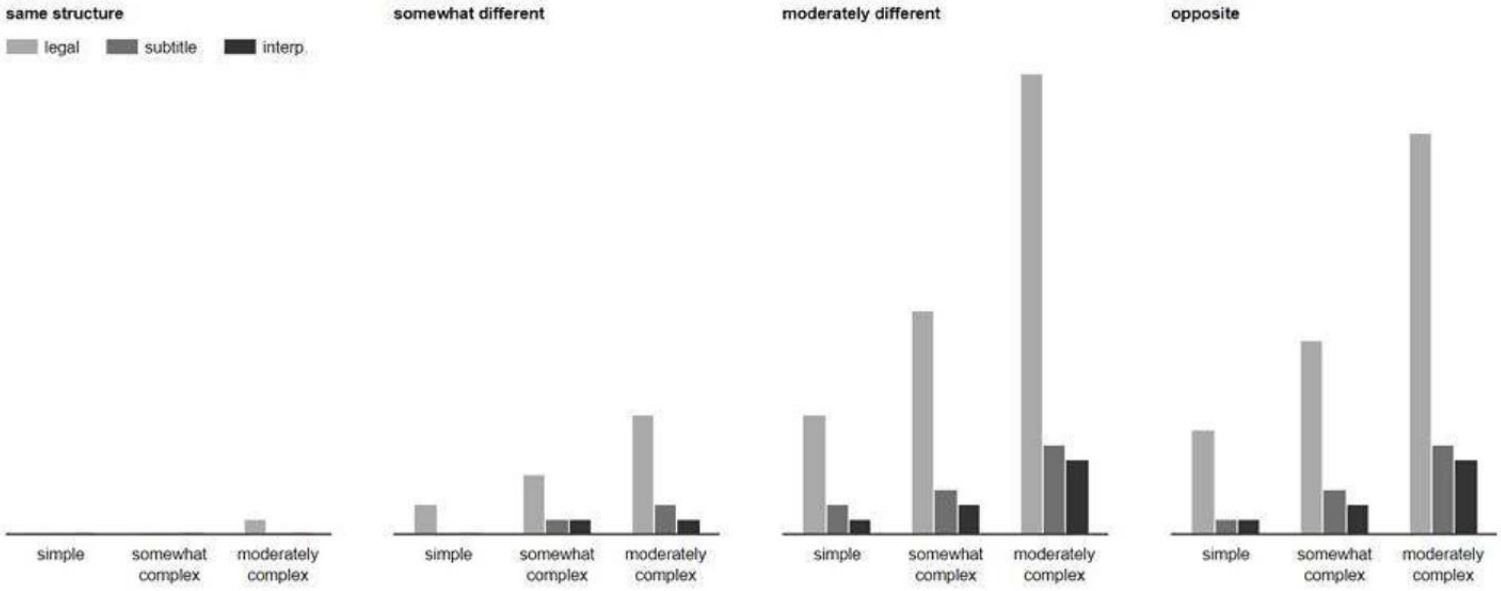


Changes in single nestings: predicted to increase greatly with **structural difference** and **sentence complexity** (no clear pattern by mode)

Let's look next at the combined effect of the independent variables on **changes in double nestings**. The predicted mean rates of changes in double nestings per sentence are visualized in **Chart 3**.

Chart 3

Predicted mean rates of **changes in double nestings** per sentence corresponding to interactions between **structural difference, sentence complexity** and **mode**

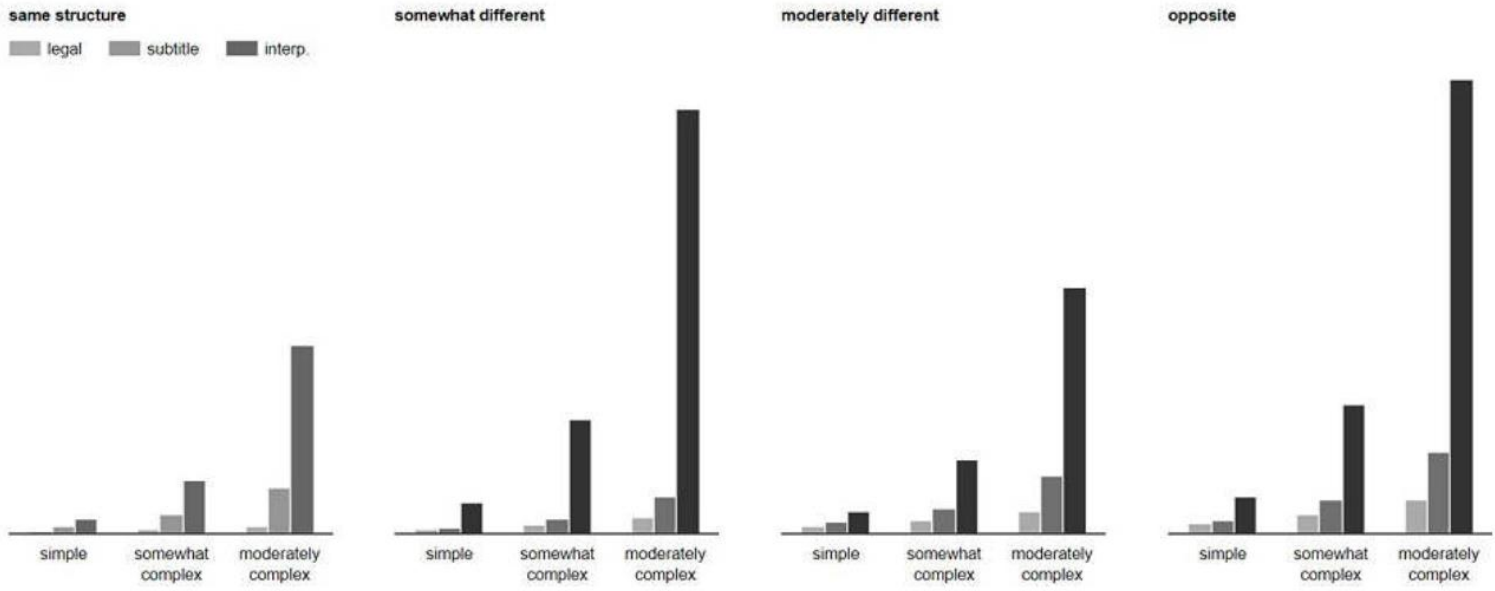


Changes in double nestings: predicted to increase greatly with **structural difference** and **sentence complexity, especially in legal translation**

Finally, let's look at the combined effect of the independent variables on **changes in semantic relations**. The predicted mean rates of changes in semantic relations per sentence are visualized in **Chart 4**.

Chart 4

Predicted mean rates of **changes in semantic relations** per sentence corresponding to interactions between **structural difference, sentence complexity** and **mode**



Changes in semantic relations: predicted to increase with **structural difference** and **sentence complexity**, **especially in simultaneous interpretation**

A reliability check was also carried out on 10% of the sentences in the corpus, to confirm the validity of the data recorded. The new analysis took place several months after and independently from the first analysis. The results confirmed almost perfect agreement between the first and the new analysis.

7. Discussion

A statistical analysis of our corpus data involving English and five target languages from different families has shown that recorded rates for all three features identified as indicators of difficulty in translation or interpretation are closely volvassociated with structural difference in the language pair involved. In the sentences analyzed, the highest rates for each indicator were observed in Turkish and Japanese. Of the languages considered, those were the ones with the greatest structural difference from English. Reordering and nesting changes were much more frequent in legal translation than in the other two modes. Changes in semantic relations were especially characteristic of simultaneous interpretation.

Based on the corpus data, the models chosen for our statistical analysis also predicted a number of associations which may be generalized to similar texts, talks and speeches. The rates for each indicator of difficulty were predicted to increase greatly with increasing structural difference of the language pair and increasing sentence complexity. In legal translation, this was especially true for reordering and nesting changes, and in simultaneous interpretation for changes in semantic relations.

The associations found between structural difference in the language pair of translation or interpretation and rates recorded for the three indicators of difficulty have some general implications which apply to all three modes of language transfer considered in this study. Those associations suggest that, the more a language pair differs in structure: (a) the more the linear order of propositions is likely to change in translation or interpretation of a complex sentence in that pair, (b) the more nested structures are likely to be created or eliminated in translation or interpretation of a complex sentence in that pair, and (c) the more the semantic relations between propositions are likely to be changed in translation or interpretation of a complex sentence in that pair. Taken together, these findings suggest that, across all three modes of transfer, the more a language pair differs in structure, the more difficult it's likely to be to translate or interpret a complex sentence in that pair, and the more the original meaning is likely to be changed.

Determining the precise causes for these associations is beyond the scope of this study. Below are some speculative explanations as to why structural difference in a language pair may make it more difficult to translate or interpret complex sentences in that pair, along with some related observations.

7.1 Structural difference and reordering

It's been shown (Hawkins 2014) that having to keep several logical processing windows open at a time – as a translator or interpreter needs to do if juggling propositions around in different order – is more difficult than opening one logical processing window at a time, closing it, then moving on to the next one – as a translator or interpreter can do if transferring propositions in parallel order. It's also been shown (Donolato, Giofrè and Mammarella 2017) that recalling verbal information in reverse order is harder than recalling it in the order it was received.

Reordering is also worth recording to quantify it in its own right. It's informative to see, for each language pair, how far away the average proposition needs to be shifted in different modes of language transfer. In legal translation of a complex sentence between languages with very different structure, like English-Turkish and English-Japanese, the total number of place shifts recorded in this study sometimes reached triple digits for a given sentence, while the same sentence had been translated with little or no reordering between structurally similar languages.

7.2 Structural difference and nesting changes

The findings of this study suggest that translation or interpretation of a complex sentence from a right-branching language like English into a left-branching language like Turkish, Japanese or to some extent Mandarin is likely to lead to many more nestings in the translated or interpreted version of the sentence than in the original version, and therefore to be more difficult to produce and to process. This may be partly due to a basic asymmetry between the two directions in which a subordinate proposition can branch from its parent.

Left-branching languages tend to be "head-final," with a phrase head typically coming at the end of its phrase in most phrase types. So a syntactic phrase expressing a proposition in such a language will generally have its predicate at the end of the phrase, preceded by any other constituents. One of those constituents is likely to be the subject of the predicate, which, even in a left-branching language, tends to be near the beginning of the phrase. This can make for lots of long-distance attachments, with several constituents sandwiched between the subject and predicate of a long proposition. One or more of those intervening constituents can themselves be propositions. And any of those nested propositions can in turn be split, leading to multiple layers of nesting.

In my experience, a long, complex sentence in a left-branching language tends to have many more nestings than a comparable sentence in a right-branching language. A Turkish or Japanese legal text, for example, is likely to have sentences with many more nestings and long-distance attachments than a comparable text drafted in English, German or Russian. This makes the phrasal combination domains in those sentences more difficult to establish and to process.

Also in my experience, this nesting tendency of left-branching languages is liable to be compounded in translation from a right-branching language. A sentence in a European language can be long and complex, but have few or no nestings, consisting of a series of unbroken propositions, with each subordinate proposition linked to the end of its parent. But transferred with structural accuracy into a language like Turkish or Japanese, that same sentence can often end up with multiple nestings. This typically happens in written translation, in a genre characterized by long, complex sentences – unless the translator makes a special effort to change the hierarchical structure of the original so as to avoid nested structures in translation. They may be reluctant to do that, especially in a text which has legal consequences, or even in an article they wish to translate faithfully. Changing the hierarchical structure of an original sentence in translation also risks distorting its meaning.

7.3 Structural difference and changes in semantic relations

A change in semantic relations in a written translation of a complex sentence compared to the original version of that sentence presumably means that the translator has: (a) had trouble understanding the structure of the source language, (b) had trouble reproducing that structure in the target language, or (c) chosen to depart from the original structure for some reason. Such a change can also result from any combination of the above factors.

A translator working between languages with largely parallel structure, like two European languages, can generally reformulate the propositions of a complex sentence one by one and in order. This includes the subordinating links between propositions – like subordinating conjunctions, relative pronouns and prepositions – which they can transfer directly from one language to the other, without having to take apart and reconstruct the logical relation established by each one.

On the other hand, if a translator working in a language pair with very different structure chooses or needs to change the hierarchical relations between propositions in the translation of a complex sentence compared to the original version, that may be because faithfully

reproducing those relations would result in a translation that's hard to process or that sounds awkward. Such restructuring is likely to involve extra effort. Changing the hierarchical relations between propositions also creates a greater risk of distorting the original meaning.

In simultaneous interpretation between structurally different languages, a change in semantic relations compared to the original can be due to any of the reasons described above for written translation. It's also likely to be due to the fact that too great a burden has been placed on the interpreter's working memory.

7.4 Differences between modes

This study has established preliminary associations between structural difference in a language pair and recorded rates for indicators of difficulty in translating or interpreting complex sentences in that pair, with some differences according to the mode of language transfer. The higher rates observed and predicted for reordering and nesting changes in language pairs with very different structure appear to be especially characteristic of legal translation. This may be due to the greater sentence complexity typical of legal texts, and to the fact that standard written translation is largely free from the time, space or working memory constraints inherent to the other two modes. On the other hand, higher rates for changes in semantic relations appear to be especially characteristic of simultaneous interpretation.

Among the language pairs considered, the observed and predicted rates for reordering and for nesting changes in language pairs with very different structure are relatively low in subtitle translation and simultaneous interpretation, and appear less strongly associated with structural difference in those modes than in legal translation. For subtitle translation, this more parallel order with respect to the original may be partly due to the need or desire for subtitle segments to run parallel to the video image. For simultaneous interpretation, it may be partly due to the constraint on interpreters' working memory.

On the other hand, the observed and predicted rates for changes in semantic relations in language pairs with very different structure are particularly high in subtitle translation and in simultaneous interpretation, and appear more strongly associated with structural difference in those modes than in legal translation. This may be for similar reasons to those suggested for reordering and nesting changes. In subtitle translation, the timing constraint can lead a translator to prefer a more parallel order to the original than would be the case in

a standard written translation, thereby distorting the relations between propositions. In simultaneous interpretation, the working memory constraint can have a similar effect.

These findings suggest that there may be a trade-off between ease of production and preservation of meaning in translation or interpretation of complex sentences between languages with very different structure. Subtitle translation and simultaneous interpretation in such pairs seem to be characterized by more parallel order to the original and more manageable structure in the output than legal translation. But that comparative ease may come at the price of greater changes to the hierarchical relations between propositions, meaning greater potential distortion of the original message.

8. Conclusion

Is structural difference in a language pair associated with difficulty in translating or interpreting complex sentences in that pair? The tentative answer given here to that questions is: *Yes.* This study has established preliminary associations between structural difference in a language pair and recorded rates for indicators of difficulty of translating or interpreting complex sentences in that pair, with some differences according to the mode of language transfer.

Can anything be done to reduce that difficulty? In my opinion, the short answer is: *Not much.* Various strategies – like sentence division, anticipation and changing syntactic structure – can be practiced and applied for coping with the working memory constraint in simultaneous interpretation. But the main take-away from this study is that translating or interpreting complex sentences can be much more difficult between languages with very different structure than between structurally similar ones – so much so, particularly in interpretation, that the challenge can seem insurmountable. Even if not much can be done about it, it can still be useful to be aware of that difficulty – its nature, its causes, how intractable it can be, as well as its potential effects.

When we say "languages with very different structure," what languages are we talking about besides the ones considered here? Based on typological classifications by Dryer (2013) and Schmidtke-Bode and Diessel (2017), languages with the **same complex sentence structure** as English (relative and complement clauses which both typically branch to the right) include most Indo-European languages, as well as languages like Arabic, Hebrew, Indonesian, Swahili, Thai and Vietnamese. Languages with **somewhat different structure** from English (relative clauses which typically branch either way and complement clauses which typically branch to the right) include Armenian, Finnish and Hungarian. Languages with **moderately different structure** from English (relative clauses which typically branch to the left and complement clauses which typically branch to the right) include Sino-Tibetan languages, Basque and Georgian. Languages with **opposite structure** from English (relative and complement clauses which both typically branch to the left) include Turkish, Japanese and Korean.

The findings of this study may help confirm the impressions of many professionals, who feel from experience that translating or interpreting complex sentences can be much more difficult between languages with very different structure than between structurally similar languages. The findings also confirm that structural difficulties manifest themselves differently in different modes of language transfer. Because of space and time constraints in subtitle translation and the working memory constraint in simultaneous interpretation, those

two modes appear to be associated with more parallel transfer and easier-to-process output structure than legal translation. But that greater ease in production and processing seems to come at the price of more changes in hierarchical structure and therefore potentially in meaning.

Impressions of the comparative difficulty of transferring complex sentences between languages with major differences in structure can seem obvious to professional translators or interpreters with relevant experience. Still, stating such impressions explicitly can be somewhat taboo. This is true for a number of reasons, including good ones like professional solidarity. This study hopes to go some way towards dispelling that taboo, by helping to highlight structural difference in a language pair as a major potential factor of difficulty – in addition to other linguistic and cultural factors which can complicate the task of translating or interpreting between languages from different families and different parts of the world.

Particularly for simultaneous interpretation, the natural constraint on working memory can make it nearly impossible to interpret complex sentences between structurally very different languages with anything approaching the completeness, accuracy, emphasis and style of a good written translation.

To draw an analogy, a translator can be likened to a swimmer in a pool. They first survey a sentence, then dive in and start swimming forward. The greater their expertise, the more skillful they are in technique, elegance and speed. And they're in control, as the water of the text is still, allowing them to proceed as quickly or as slowly as they like.

Continuing the analogy, a simultaneous interpreter can be likened to a swimmer in a river with a current. They have less control as they swim than the translator does in the pool. Where the current isn't too fast, they have time to maneuver around obstacles. They can speed up or slow down relative to the flow. But ultimately it's the speed of the current which determines their pace. And if they're swimming downstream, the direction of flow helps immensely by propelling them in the right direction.

This propelling effect is so essential and so constant that interpreters take it for granted when swimming downstream – working between languages where propositions follow each other in similar order. It's only if an interpreter has to swim upstream – working between languages where propositions come at them in reverse order – that they realize how tough it can be to fight the flow. If the current isn't too strong, they can manage, though with considerably more effort than swimming downstream, and less gracefully. But if the speaker's propositions come

rushing at the interpreter in a very different order from an order in which they can process and reformulate them coherently, the task can become overwhelming.

When professional simultaneous interpretation was first developing, some experts claimed that interpretation between languages with very different structure was simply not possible: “Some languages, such as Japanese, do not permit simultaneous interpreting, due to the complexity of their grammatical structure” (Bower 1959, cited in Davidson 1992: 1). “That’s impossible,” said Sen Nishiyama, one of the pioneer consecutive interpreters in Japan, in 1945. “The word order of English and Japanese is exactly opposite. It just can’t be done” (Torikai 2009: 92).

This study suggests that there may be some truth to those early impressions. Major structural difference in some language pairs (like between a European language and Turkish, Mandarin or Japanese) may well mean that it simply isn’t possible to interpret complex sentences in such a pair with the same degree of accuracy, detail and coherence as between two European languages. For different reasons and perhaps to a different extent, the same may also apply to subtitle translation in a structurally very different pair. As for legal translation between languages with very different structure, the difficulty may be felt mostly by the translator and reflected less in the output than for the other two modes – although that output may also be harder to read than the output of translation in a structurally similar pair.

I hope the findings of this study will prove interesting and useful to linguists, students, teachers, and professional translators and interpreters. It may help confirm impressions from experience, inform individual or policy decisions, or provide a basis for targeted training or future research. If so, it will have achieved its aim.

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