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# Competition in Frisian Past Participles



Anne Merkuur, Jan Don, Eric Hoekstra, and Arjen P. Versloot

**Abstract** This paper evaluates recent developments in the inflection of Frisian past participles and how to account for them with the aid of a model of morphological productivity. In Frisian, there are two alternative types of past participles which both have their origin in the South-western dialect region of Fryslân, but of which only one is spreading productively across the whole language area. The natural existence of contact between the original dialect region and the rest of the language area, in theory enables both alternative types to spread. Also, both of them can be described with rules. We will therefore argue that the reason for the spread of only one of the alternatives is due to the productivity of its underlying rule. Specifically, we will argue that the Tolerance Principle (Yang, *Linguis Var Yearb* 5(1):265–302, 2005, The price of linguistic productivity: how children learn to break the rules of language. MIT Press, 2016) predicts both the difference in productivity between the two alternatives, as well as the productive spread of one of the alternatives outwards from the dialect region in which it originated.

**Keywords** Frisian · Language change · Language contact · Productivity · Tolerance principle · Verbal inflection

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195

## 1 Introduction

The topic of our investigation concerns two alternative dialect forms of past participles in Frisian, of which only one is spreading across the whole Frisian language area. The first alternative involves a subclass of weak verbs, the second involves a subclass of strong and irregular verbs. Let us first turn to the domain of the weak past participles. Frisian has two classes of weak verbs (class I with an infinitive ending in *-ə*, class II with an infinitive ending in *-jə*), both with their own inflectional paradigms. Past participles of weak class I verbs are marked with the suffix *-t* or *-d*,<sup>1</sup> as in (1) (norm).

Alternatively, in the South-western part of the province, participles of weak class I verbs can be extended with the suffix *-en* [ən], in case the verbal stem is monosyllabic and ends in *-t* or *-d*. This *-en* suffix normally marks the participles of strong and irregular verbs. Some examples of the competing past participle forms of these weak class I verbs in *-t* or *-d* are given in (1). We will refer to the variants as the ‘normative’ and ‘alternative’ forms.

(1)	normative	alternative
<i>prat-e</i>	<i>praat-t</i> → <i>praat</i> <sup>2</sup>	<i>prat-en</i>
[pra:tə]	[pra:t]	[pra:tən]
talk-INF	talk.PTCP	talk-PTCP
<i>meld-e</i>	<i>meld-d</i> > <i>meld</i>	<i>meld-en</i>
[mɛldə]	[mɛlt]	[mɛldən]
notify-INF	notify.PTCP	notify-PTCP

The second instance of competition concerns strong and irregular<sup>3</sup> verbs. Normatively, past participles of strong (and some irregular) verbs are marked with the suffix *-(e)n*. In the South-western dialect area, however, such past participles may be extended with the weak class I suffix *-d*, when monosyllabic and ending in *-n*. For example, the past participle *sjoen* from the verb *sjen* (to see) competes with the alternative form *sjoend*, as shown in (2):

<sup>1</sup>The choice for the *-d* or *-t* affix is a purely phonological issue; stem-final voiceless consonants take *-t*, elsewhere *-d* is inserted (Tiersma 1999).

<sup>2</sup>Note that the difference between single or double vowels, such as *a* and *aa* in this example, is orthographic. Both of them here represent the long vowel [a:].

<sup>3</sup>In line with the online Frisian Grammar at [Taalportaal.org](http://Taalportaal.org) (Dyk 2015), we distinguish three types of inflection classes: weak, strong and irregular. Weak are those classes that are totally regular. The strong class exhibits various vowel alternation patterns for tense marking. Irregular verbs show both vowel and consonant alternations, varying over tense, person and number.

(2)	norm	alternative
<i>sjen</i>	<i>sjoe-n</i>	<i>sjoen-d</i>
[ʃɛn]	[ʃuən]	[ʃuənt]
see-INF	see-PTCP	see-PTCP
<i>stjerre</i>	<i>stoar-n</i>	<i>stoarn-d</i>
[stjɛrə]	[stoən]	[stoənt]
see-INF	see-PTCP	see-PTCP

In order to understand and interpret the development of these forms, we need a precise overview of their distributions over time. In Merkuur et al. (Forthcoming) we studied the historical and current distribution of both alternative forms, of which we will present the main results in Sect. 2. It turns out that both alternatives have been present as dialectal forms already since the late Middle Ages in the South-western part of Fryslân, but that currently the alternatives of the type in (1) (type I hereafter) are spreading from the South-west into the rest of the province, whereas the alternatives of the type in (2) (type II hereafter) remain restricted to the South-west. So, although the contact between the South-west and the rest of the language area in theory enables both forms to spread, only those of type I actually do so.

Both alternatives have been interpreted as the result of a process of reanalysis, whereby the normative forms are analysed as lacking a suffix (Hoekstra and de Haan 1993; Tiersma 1999; van der Veen 1980). As a result, these forms are extended with a new suffix, making them more transparently inflected. We will analyse both forms in Sect. 3 and show that indeed, both alternatives can be described as the result of a process of reanalysis. We will specifically argue that they are the product of alternative rules, both of which are potentially productive, in line with their historical productivity at a certain point in the South-western region.

Although such a reanalysis account may help us understand the initial emergence of those forms, it does not explain why only type I alternatives spread and type II alternatives do not. We will therefore argue that neither dialect contact, nor reanalysis can by itself explain the difference in spreading between both alternative forms, and conclude that this difference must be due to the present-day productivity of the rules underlying the alternative forms.<sup>4</sup> In Sect. 4 we study their productivity with the aid of Yang's Tolerance Principle (2005, 2016) (TP hereafter). It turns out that the TP is able to shed light on the reason for the spread of the type I alternatives outwards from the South-western dialect region. Furthermore, the TP correctly predicts type II alternative forms to remain dialectical variants, because the underlying rule never reaches productive status. We will conclude this paper in Sect. 5 by stating that, due to its precise nature of measuring productivity based on language input, the TP is specifically well suited to model language change through productivity and contact.

<sup>4</sup>For examples of forms that, contrary to the Frisian past participles, do not seem to compete, see the study by Thornton (2019), which shows that many languages at one point exhibit some cases of what is defined as overabundance: situations in which two (or more) inflectional forms co-exist.

## 2 Frisian Past Participles

In this section, we will present the methods and results of our study on the historical and current distribution of both alternative past participle forms (Merkuur et al. [Forthcoming](#)). The results show that from the sixteenth up till the nineteenth century both alternative forms are only reported as and only occur as (south)-western dialect forms. During the twentieth century, type II forms remain restricted to this area, whereas type I forms occur outside this area more and more. Data from a recent dialect survey show that even in other regions, the alternative type I forms are not the minority and occur as often as their normative counterparts. This difference between earlier and current stages, and the effect of region that was found in the dialect survey, point towards an ongoing change in which the type I alternative forms are spreading outwards from the (south)western dialect region over the whole province.

### 2.1 Historical Background

Merkuur et al. ([Forthcoming](#)) searches for alternative forms in the Old Frisian period (before 1550) and the Early Modern Frisian period (1550–1800) using sources such as dictionaries, grammars and the Frisian Language Database (2009). For the New Frisian period (1800-), several dialect studies and surveys dating back to respectively 1933, 1955 and the 1980s and 1990s were studied (Hof 1933; Boelens and Van der Woude 1955; Goeman et al. 1980; Van der Veen 1980).

It turns out that both types of alternatives already occurred alongside normative forms in (late) Old Frisian, and even more so in Early Modern Frisian. Alternative forms of the type I verb *setta* (MFr: sette, Eng: to set) date back to the early sixteenth century, and keep occurring during the seventeenth and eighteenth century. In the eighteenth century also an alternative form of the verb *switte* (to sweat) occurs in the database. Of the type II verbs, more alternative forms can be found already in the sixteenth century: *skriva* (MFr: skriuwe, Eng: to write), *jeva* (MFr: jaan, Eng: to give), *bliva* (MFr: bliuwe, Eng: to stay/remain) and *habba* (MFr: hawwe, Eng: to have). In the seventeenth and eighteenth century alternatives of *bine* (to bind), *fine* (to find), and *begjinne* (to begin) are found. All attested forms of which the source could be located, can be situated in the west of the province. Both their locations and their numbers indicate that the two alternative forms were South-western dialect forms during the sixteenth, seventeenth and eighteenth century.

Formal descriptions of Frisian in the form of grammars and dictionaries since the nineteenth century mention type I alternative forms not before 1900 (Postma and De Clercq 1904). Since then, practically all grammars in the twentieth century mention the alternative forms (Sipma 1913, 1949; Sytstra and Hof 1925; Tuinstra 1937; Fokkema 1967; Tiersma 1999; Eisma and Popkema 2000; Popkema 2006). The Frisian dictionary first listed the type I alternative past participle *setten* (Frysk

**Fig. 1** map of the verb *bliuwe*. (Hof 1933, p. 60)



Wurdboek 1956) as a legitimate possibility in Standard Frisian, alongside the normative past participle *set*.

Fokkema (1967) is the first grammar to mention type II alternatives. This reflects the lacking appreciation in particular of type II alternatives in the written standard language. After that most grammars mention the alternative forms as (south)western dialect variants (Fokkema 1967; Tiersma 1999; Eisma and Popkema 2000; Popkema 2006). Already in 1933, Hof (1933) describes the distribution of the type II alternatives mapping the different past participle forms of the verb *bliuwe* (to stay), and locates the alternative forms (*bljound*) strictly in the narrow south-west of the province (Fig. 1).

Twenty years later, Boelens and van der Woude (1955) also include 8 type II past participles in their Regional Dialect Atlas RND. The mean results (Fig. 2) of the 110 participants show that the alternative forms occur mostly in the (south)western area.

Goeman et al. (1980) included test sentences with the type I past participles of *barste* (to burst) and *sette* (to set). The map in Fig. 3 shows the mean result of both verbs per region, and shows that type I alternatives no longer only occur in the west.

Goeman et al. (1980) also included test sentences with type II past participles. On average, the 18 tested type II verbs were used alternatively only 11,5% of the times. The map in Fig. 4 shows that the centre point is still located in the (south)west. Note the difference in the colour scale in the two maps: in Fig. 3, hardly any region has a value below 50%. In Fig. 4, the alternative form is only the majority in a small region in the ultimate south west of the province.

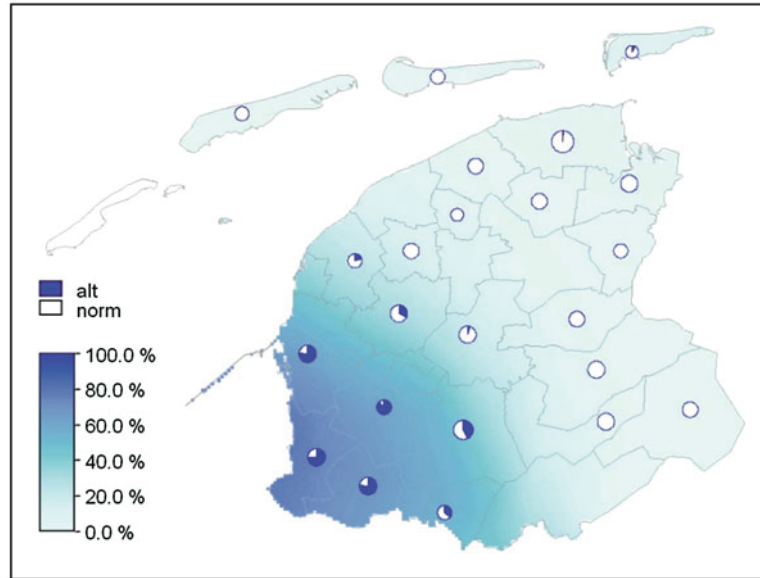


Fig. 2 % alternative type II forms per region. (Boelens and Van der Woude 1955), n = 110

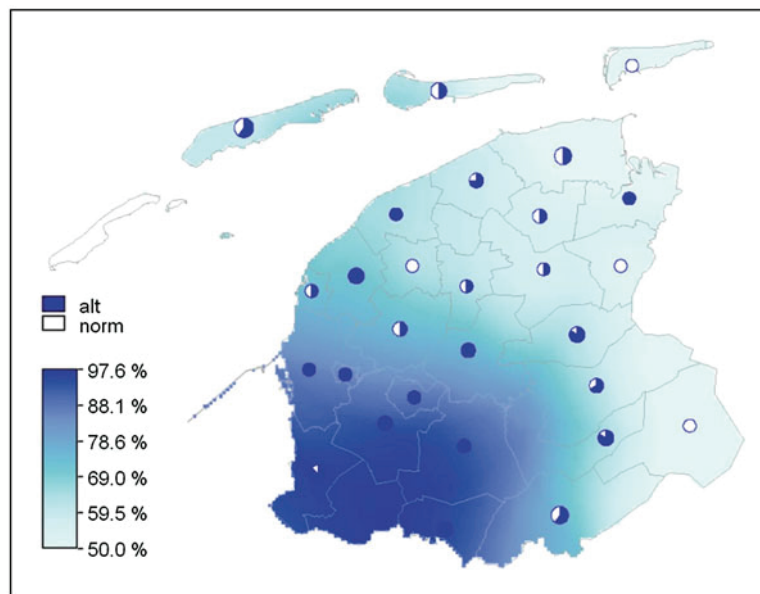


Fig. 3 % alternative type I forms per region. (Goeman et al. 1980), n = 57



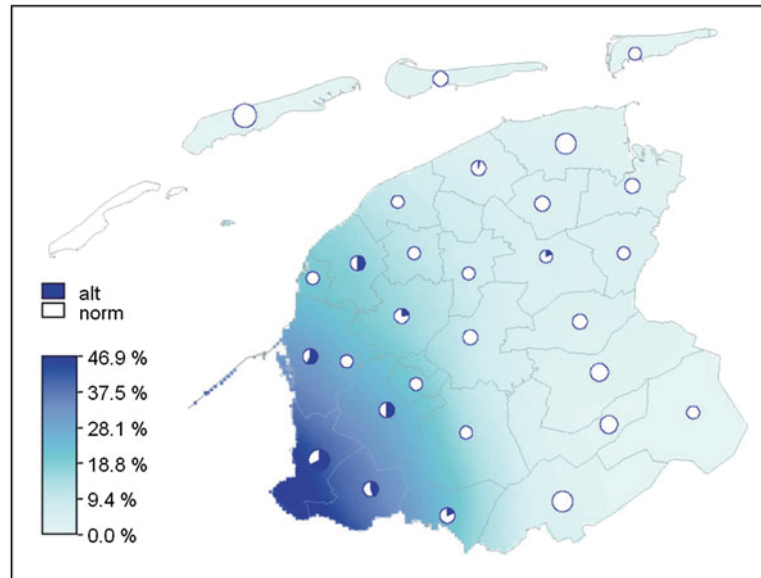


Fig. 4 % alternative type II forms per region. (Goeman et al. 1980), n = 57

It can be concluded that already in the sixteenth century, both types of alternatives occur alongside normative forms in the west of the province, and that they keep doing so during the seventeenth, eighteenth and nineteenth century. In the first half of the twentieth century the two alternatives seem to part ways. The type I alternatives begin their rise and even make it to the dictionary halfway the twentieth century. Goeman et al. (1980) shows that the type I forms are no longer just present in the (south-)west, but also occur in the rest of the province and that the type II alternatives occur exclusively in the south-western part of the province.

## 2.2 Current Distribution

Merkuur et al. (Forthcoming) conducted an online questionnaire to get a clear view on the current distribution of both forms. Participants had to produce verb forms, by filling in the gaps in sentences of the type in (3).

- (3) juster      seach      ik              him  
 yesterday   see.st    I              him  
 mar        hjoed      haw              ik   him   net   ....  
 but        today     have.prs.1sg    I   him   not   ....  
 ‘Yesterday I did see him but today I haven’t ... him’



In total the past participles of 10 type I verbs and 14 type II verbs were elicited. The verbs were selected on the basis of secondary features, such as token and lemma frequency and phonological make-up. Several questions regarding the sociological, geographical and linguistic backgrounds of the participants were included in the survey in order to control for them.

Expectations regarding productivity and spread were that if participants showed no significant differences among the verbs (which differ with respect to their frequency and phonological make-up), this would point towards structural use of the alternative forms. Regarding the spreading of the forms, one would expect an effect of region on the amount of usage when the forms were spreading outwards from the dialect area.

#### Results – Type I

Although people using the alternative forms mostly live in the west (Fig. 5), it turns out that the forms are used throughout the whole province. On average, participants inflected type I verbs alternatively in 61% of the cases and normatively 26% of the times. There were no significant differences found between men and women, between age groups or participants' educational levels. The language background of the participants also did not have a significant effect, nor did the fact whether they have had language training in Frisian.

When it comes to the verbs themselves, it turned out that there were no significant differences between the amounts of alternative inflections, and that there thus were

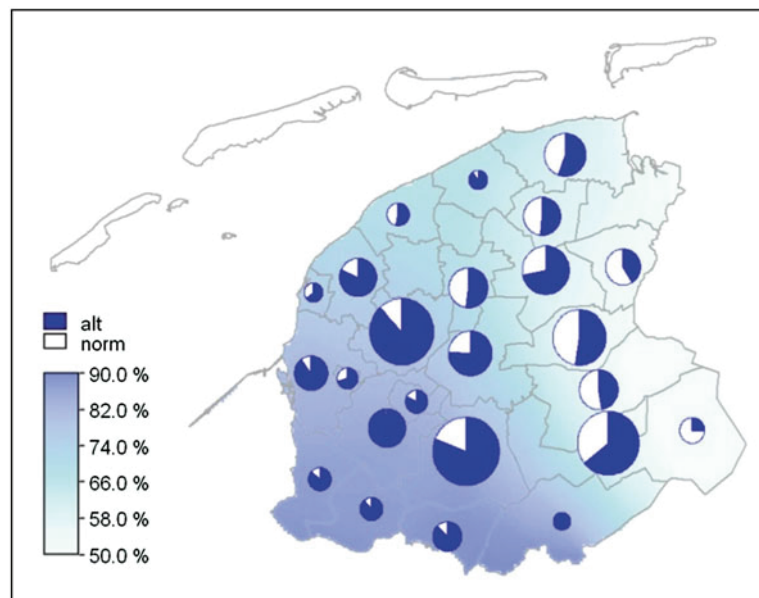


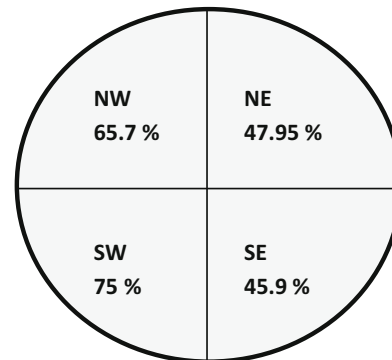
Fig. 5 % of mean alternative inflections of 10 type I verbs (*prate*), by n = 271

no effects of features like sentence order or of verbal features like frequency on people’s inflection of the verbs.

Looking more closely at the use of the alternatives of type I (*praten*) in the different regions people live in (Fig. 6), there was an effect ( $F(4,266) = 10,123$ ,  $p < .01$ ,  $r = 0.36$ ) of region on the use of alternative forms. The differences between east and west are the largest, indicating mainly a west-east difference in the use of alternative forms of type I.

To get more grip on the influence of region, a regression analysis was conducted in which the exact longitudes and latitudes of the locations where people grew up, and where people live, were included as the independent continuous variables. It turned out that the longitude of the location where participants grew up was able to account for 22% ( $R^2$  change = .224) of the variance. Note that the dependent variable here is the percentage of normative inflections. The regression analysis (Table 1) shows that no other variables were able to predict the amount of normative/alternative inflections. Because of the difference between regions, we also separately checked whether there were effects of verbal features such as token or lemma frequency in the separate regions. It turned out that even in the east, where the forms are less used, there is no significant effect of verbal features such as frequency, and that the alternative forms occur for all type I verbs equally often.

**Fig. 6** % of type I alternatives per regions participants live in



**Table 1** Coefficients table of a regression analysis with dependent variable: % normative inflections of type I verbs (*prate*)

Model		Unstandardized coefficients		Standardized coefficients	Sig.
		B	Std. error	Beta	
1	(Constant)	−314,127	44,000		,000
	Longitude of county (grew up in)	,001	,000	,474	,000
2	(Constant)	−2199,711	650,035		,001
	Longitude of county (grew up in)	,001	,000	,449	,000
	Latitude of county (grew up in)	,000	,000	,177	,004

**Table 2** Coefficients table of a regression analysis. Dependent variable: % of alternative inflections per II verb

Model		Unstandardized coefficients		Standardized coefficients	Sig.
		B	Std. error	Beta	
1	(Constant)	-4422	2873		,150
	LOG10ZIPF frequency	1424	,614	,556	,039

### Results – Type II

On average the 271 participants inflected type II verbs normatively in 89.9% of the cases. Only 36 of the participants inflected type II verbs alternatively once or more than once. On average those 36 people did so in 16,5% of the cases. There were only two participants who inflected existing type II verbs alternatively in more than 50% of the cases.

In a regression analysis (Table 2), it turns out that the ZIPF frequency of the verb form predicts one third of this variance ( $R^2$  change = 0.31). The more frequent the verb is, the higher the chance is for it to get inflected alternatively. Participants who inflected type II verbs alternatively did not differ from the participants who did not when it comes to their age, educational level, or language background.

The only difference was that of region. 50% of the 36 participants using the alternatives live in the southwest of the province, 19.4% live in the northwest, and another 25% live outside of Fryslân. It is also shown in the map in Fig. 7 that the use of alternatives of type II merely concentrates in the southwest.

On average, people from the southwest and people from outside Fryslân inflected type II verbs alternatively in 4 up to 5% of the cases, compared to 0 up to 1% in the other regions (Fig. 8). This difference was significant, ( $H(3) = 26.3, p < .001$ ).<sup>5</sup>

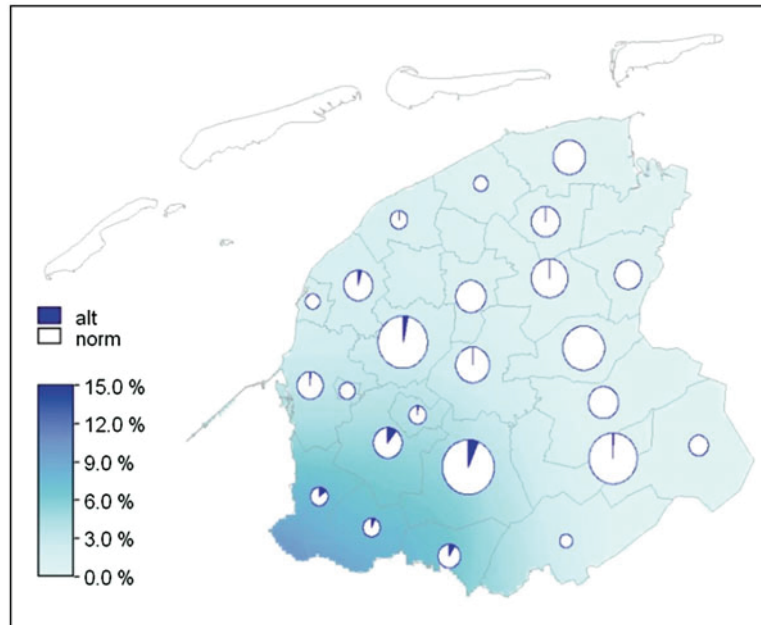
To summarize, the results indicate that the alternatives of type II (*sjoen-d, dien-d*) are currently marginal, and only occur in the original South-western dialect area.

### 2.3 Ongoing Change

Summing up, there are two alternative past participle forms, occurring in a specific dialect region, of which only one is spreading across the rest of the language area. The spreading pattern of these type I alternatives suggests that contact with the South-western dialect region gives rise to this spread, and that the forms do not arise in isolation.<sup>6</sup> This effect of region illustrates that the closer one lives to the

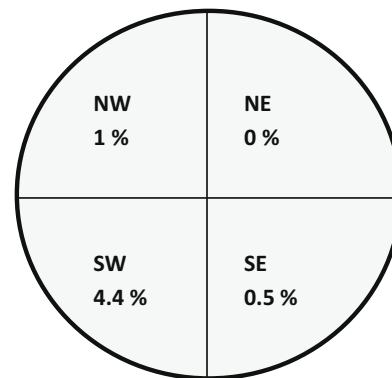
<sup>5</sup>Mann-Whitney tests were used to follow up this finding. A Bonferroni correction was applied and so all effects are reported at a .008 level of significance.

<sup>6</sup>For more examples of spreading outwards from the South-western dialect region see Hof (1933, p. 115, p. 255, p. 269), for historical examples see Versloot (2008, phonological examples p. 111, p. 141, p. 187, morphological examples p. 159, p. 179).



**Fig. 7** % of mean alternative inflections of type II verbs (*sjen*), by n = 271

**Fig. 8** % of type II alternatives per region people live in



South-west, the higher the chance is that there are some alternative forms in one's production. This spread seems to be ongoing, since the change is not completed everywhere, and there are still differences in use between the separate regions. The alternative forms are the majority in the whole province, and even in the regions farthest away from the dialect region, they do not form the minority compared to the normative forms, but co-exist with the normative forms (Merkuur et al. [Forthcoming](#)).

To address the question why the type I alternatives are spreading successfully over the whole province and the type II alternatives are not, we first need to take a look at the alternative forms in more detail in Sect. 3.

### 3 Analysis

Former studies (Hoekstra and de Haan 1993; Tiersma 1999; van der Veen 1980) explained the mere existence of the alternative past participles as the result of a process of reanalysis, the idea being that normative forms such as *praat* and *sjoen* are analysed as lacking an overt suffix, which results in the addition of a new suffix. Although reanalysis and analogy are the factors frequently mentioned in the literature (van der Veen 1980), it remains unclear exactly how the verbs get assigned this additional suffix. With regard to the alternatives of type I, Tamminga (1978) points towards analogy with a group of past participles of strong verbs. These are past participles with a stem that is similar to the present tense, also ending in *-t*: *bite*, *biet*, *biten* ('bite, bit, bitten'). The similarity between these strong verbs and the weak type I verbs lies in the identical stems of the present tense ending in *-t* or *-d*.

Ambiguity and the mere possibility of making such alternative analyses are obvious conditions for reanalysis and change. Anderson (2015) claims that opacity is the primary source of change in morphology (ib., p. 3): "The structural regularities underlying linguistic forms for a generation of speakers may not be unambiguously recoverable from the surface forms in their speech. Since those surface forms are of course the evidence on the basis of which a subsequent generation constructs their grammar, the result may be a different grammar." In such a view, change happens when generation 2 makes different generalizations on the basis of the language of generation 1. Consequently, their output may differ from the output of the previous generation. In this section, we will further explore whether it is indeed possible to make such different generalizations for type I and type II verbs. However, even if it turns out to be possible to construct such a reanalysis scenario for both alternatives, this still does not suffice to explain why only one of the alternatives spread.

Hypothesizing that both alternatives can be described as the result of reanalysis, and as the product of making different generalizations, the question arises at which point such alternative forms are able to spread? Yang (2016, p. 161) claims that "[b]oth kinds of change [analogical levelling and analogical extension, respectively] result from the application of rules to words that previously did not fall under its reign but nevertheless could have" and that "the rule/class to which levelling and extension take place must be productive." Note that Yang uses the word *rule*, rather than generalization or analysis that we used above. Here it specifically refers to a productive grammatical rule. We can thus formulate the following condition for morphological change:

- (3) (Morphological) change occurs when productive alternative analyses are possible.

This predicts that when no other productive alternative analysis can be made, nothing changes. Or that when no analysis can be made at all, lexical gaps occur, as is indeed shown by Gorman and Yang (2019). The condition for change in (3) requires an investigation into the productivity of the rules underlying the alternative forms, to which we will turn in Sect. 4. But first, it should be established whether the alternative forms can be described by different rules. In the remainder of this section we will therefore analyse the alternative forms and the positions they take in the verbal system.

### 3.1 Theoretical View of Participle Formation

In line with Distributed Morphology (Halle and Marantz 1993) (hereafter: DM), or similar realizational models of morphology, we assume that the feature ([pst part.]), present in the morpho-syntactic representation of these verb forms, triggers the formation of past participles. Specifically, during spell-out this feature triggers particular rules that realize this morpho-syntactic feature. The rule in (4) would be the default spell-out rule of the feature [pst part.] in Frisian:

- (4) [pst part.] → *-dl-t*

Rule (4) is the most general rule in Frisian for the formation of past participles, but it is clearly not the only rule since almost all strong and some irregular verbs take the *-en* suffix. So, next to (4), the Frisian grammar also hosts the rule in (5) which is more limited in scope. The scope of the rule is expressed here by a list of verbs it applies to:

- (5) [pst part.] → *-en* / [sitte, lêze, falle, . . . , etcetera]

Rule (5) is an exception to the more general rule (4) and, following the Elsewhere Principle (Kiparsky 1973), (5) is therefore ordered before (4).

Apart from the choice of suffix (*-en* rather than *-td*), strong and irregular verbs also differ from weak verbs in undergoing stem changes. For example, the verb *sjen* ‘to see’ has a past participle *sjoen* ‘seen’. We assume that here the suffix *-(e)n* spells out the past participle feature while the stem change follows from a so-called readjustment rule (following Halle and Marantz 1993). According to DM, these readjustment rules are to be separated from the rules of exponence, i.e. those rules that ‘realize’ or ‘spell-out’ the triggering morpho-syntactic feature. So, these readjustment rules cannot be ordered with respect to, nor can they block, the rules in (4) and (5): they form a separate set.

### 3.2 Analysis of the Type I Forms ‘*praten*’

Apparently, the type I alternatives, which get the *-en* suffix attached, are no longer only the result of the regular rule for past participles in (4) (stem + *-t/-d*). The Elsewhere principle prevents double marking, which excludes an analysis in which both *-t/-d* and the *-en* suffix realize the [pst part.]-feature. In Table 3 the readjustment rules and primary exponence rules applying to the normative type I past participles such as *praat* ‘talked’ are visualized.

If we assume that the final *-t/-d* is no longer analysed by speaker/hearers as an exponent at all because the stem of the verb already ends in *-t/-d*<sup>7</sup> (a view proposed by van der Veen 1980, Hoekstra and de Haan 1993 and Tiersma 1999), the *-en* suffix in alternative forms such as *praten* can indeed be considered a primary exponent. The alternative forms can be described accordingly by the rule in (6), which states that the suffix *-en* spells out the past participle feature of all monosyllabic stems in *-t* or *-d*.

(6) [pst part.] → *-en* / [monosyllabic stems in *-t/-d*]

Past participles of strong verbs with monosyllabic stems in *-t* or *-d*, such as *sitte* in Table 4, are similar to these weak type I alternatives because, as strong verbs, they normally already get the *-en* suffix, resulting in *sit-en*.

In a situation without type I alternative forms in the input, these strong verbs are expected to be under the scope of the rule in (5) while the weak type I verbs are likely to be under the scope of the regular rule in (4). When encountering South-western alternative forms, however, the alternative analysis comes into effect, resulting in all monosyllabic verbs with stems in *-t* or *-d* getting the *-en* suffix due to the rule in (6), regardless their being weak or strong.

**Table 3** Readjustment and exponence rules applying to normal and alternative type I past participles

Verb	Readjustment rule	Exponence rule normative	Exponence rule alternative
Prate [pra:tə] (to talk)	None: prat [pra:t]	+ <i>t</i>	
Prate [pra:tə] (to talk)	None: prat [pra:t]	None	+ <i>en</i> [ən]

**Table 4** Readjustment and exponence rules applying to strong verbs in *-t* or *-d* and alternative type I verbs

Verb type	Verb	Readjustment rule	Exponence rule
Strong in <i>-t/-d</i>	sitte [sitə] (to sit)	None: sit [sit]	+ <i>en</i> [ən]
Type I	prate [pra:tə] (to talk)	None: prat [pra:t]	+ <i>en</i> [ən ] (alternative)

<sup>7</sup>Note that geminate consonants are not phonologically distinctive in Frisian and an underlying form /pra:tt/ will come out as [pra:t] in the surface form. The same applies later on, for the type II forms with a potential double /n/.



**Table 5** Readjustment and exponence rules applying to normal and alternative type II past participles

Verb	Readjustment rule	Exponence rule norm	Exponence rule alternative
Sjen [ʃɛn] (to see)	sjoe(n) [ʃuən]	+ <i>n</i>	
Sjen [ʃɛn] (to see)	sjoe(n) [ʃuən]	None	+ <i>d</i> [t]

**Table 6** Different type of verbs with type II past participles

	INF	PST	PST.PTCP	PST.PTCP ALTERNATIVE
1	bliuwe (to stay)	bleau	bleaun	bleaun- <i>d</i>
2	fine (to find)	fûn	fûn	fûn- <i>d</i>
3	dwaan (to do)	die	dien	dien- <i>d</i>

### 3.3 Analysis of the Type II Forms ‘sjoend’

Similar to the above, the type II normative forms such as *sjoen* ‘seen’ (Table 5) also lack an audible suffix that is recognizable as the past participle suffix. That is, in these monosyllabic forms, the final *n* could just as well be the final stem consonant. Again, these normative forms can be interpreted as lacking an audible primary exponent and *-d* can be interpreted as the suffix that spells out the past participle feature. Note that such an analysis presupposes a distinction between readjustment rules and rules of exponence.

If we want to formulate a rule for these alternative forms, we run into the problem that there are no structural resemblances amongst these verbs (comparable to the final *-t/-d* in the type I cases). Their stems do not necessarily contain an *-n*. As is shown in Table 6, they fall into three subgroups:

1. Strong and irregular *-e* verbs with *-n* only in the past participle;
2. Strong *-e* verbs with an *-n* throughout the paradigm;
3. Irregular *-n* verbs which only have an *-n* in parts of the paradigm.

Because these verbs do not share a context for a rule to apply to, we cannot formulate an exponence rule that specifically applies to these verbs. The only shared structural similarity involves the form of their past participles. These are monosyllabic and ending in *-n*. Therefore, the rule for the type II alternatives can only be formulated as a rule that operates on an already formed past participle. If, however, we formulated such a rule adding *-d* to monosyllabic *past participles* in *-n*, we would end up with a case of double marking (*-n* and *-d*).

(7) [pst part.] → *-d* / [monosyllabic past participles ending in *-n*]

Instead, we propose an alternative analysis in which we do not rely on double marking but analyse the final *-n* in these past participles as the result of readjustment (Table 7).

If we consider the final *-n* to be part of the readjusted forms, the final *-n* creates a common context for the alternative rule. We can reformulate (7) by stating that

**Table 7** Readjustment and exponence rules applying to normal and alternative type II past participles (3 types)

Type II		Verb	After readjustment	Exponence rule norm	Exponence rule alternative
Group 3	Norm	sjen (to see)	sjoen	sjoen + <i>n</i>	–
	Alternative		sjoen	sjoen + $\emptyset$	sjoen + <i>d</i>
Group 2	Norm	fine (to find)	ûn	fûn + <i>n</i>	–
	Alternative		fûn	ûn + $\emptyset$	fûn + <i>d</i>
Group 1	Norm	bliuwe (to stay)	bleaun	bleaun + <i>n</i>	–
	Alternative		bleaun	bleaun + $\emptyset$	bleaun + <i>d</i>

the feature [pst part.] is indeed spelled out by the suffix *-d* and that it applies to the adjusted past participle stems in *-n*.

(8) [pst part.]  $\rightarrow$  *-d* / [monosyllabic past participle stems in *-n*]

This analysis implies that exponence rules can apply to adjusted stems: therefore, such stem readjustment rules must apply before exponence rules. When there are no type II alternative forms in the input at all, the relevant strong and irregular verbs are considered to be listed under the rule in (5):

(5) [pst part.]  $\rightarrow$  *-en* / [sitte, . . . , etcetera]

Once type II alternative forms enter the input from the South-west, the alternative analysis may come into effect, such that the alternative type II past participle stems in *-n* are analysed in the same way as the stems of weak monosyllabic verbs with stem final *-n* (Table 8). These weak verbs normally already receive the suffix *-d* to form their past participle, because, as weak verbs, they are under the scope of the (default) rule in (4). Consequently, in theory the generalization can be made that all verbs with monosyllabic past participle stems in *-n* get the *-d* suffix, and the rule in (8) can be formulated for both strong and weak past participle stems in *-n*.

Note, however, that the weak verbs in *-n* do differ from the type II verbs with respect to the readjustment rules. Whereas readjustment rules alter the stems of the type II verbs, no readjustment rules apply to the weak verbs. The question remains whether this difference between the two is a problem and whether the type II alternatives can actually be grouped together with the weak verbs in *-n*. One could also argue that the rule in (8) only applies to adjusted (strong/irregular) past participle stems.<sup>8</sup> However, because the weak verbs in *-n* can possibly serve as evidence for attaching *-d* to stems in *-n*, they might provide extra support for the rule in (8). Here, we want to hypothetically give the type II alternatives as much room as possible, and therefore we do not want to exclude the possibility of the weak verbs providing extra support for the rule in (8).

<sup>8</sup>Note that there is no such difference between the type I participles and their strong lookalikes, because most of these strong verbs do not show stem alternations in their past participles.

**Table 8** Readjustment and exponence rules applying to weak verbs in *-n* and alternative type II verbs

Verb type	Verb	Readjustment rule	Exponence rule
Type II	sjen (to see)	sjen → sjoen	+ d (alternative)
Weak in <i>-n</i>	meane (to mow)	none: mean	+ d

**Table 9** Exponence rules 6 and 8, applying to type I alternatives and type II alternatives

Verb type	Readjustment rule INF stem → PTCP stem	Exponence rules 6 and 8 PTCP stem → PTCP	Result
Type I Weak verbs	no readjustment rules	monosyllabic PTCP stems in <i>-t/-d</i> → + en	
	<i>pra:t</i> → <i>pra:t</i>		<i>praten</i>
	<i>set</i> → <i>set</i>		<i>setten</i>
Strong verbs in <i>-t/-d</i>	occasionally readj. rules <i>sit</i> → <i>sit</i> <i>smelt</i> → <i>smolt</i>		<i>sitten smolten</i>
Type II Irregular verbs	various readj. rules <i>sjen</i> → <i>sjoen</i> <i>bedjer</i> → <i>bedoarn</i> <i>fin</i> → <i>fûn</i> etc.	monosyllabic PTCP stems in <i>-n</i> → + d	<i>sjoend</i> <i>bedoarn d fûnd</i>
Weak verbs in <i>-n</i>	no readjustment rules <i>mean</i> → <i>mean</i>		<i>meand</i>

### 3.4 Two Alternative Rules

Recapitulating, we analysed both alternative past participles, and formulated rules for the formation of these alternatives. Whereas the rule formulated for type II alternatives applies to past participle stems, the rule for the type I alternatives applies to infinitival stems. To get the rules in line, rule (6) can easily be adjusted to apply to past participle stems as well, because these past participle stems also end in *-t* or *-d*:

(6)\* [pst part.] → *-en* / [monosyllabic past participle stems in *-t/-d*]

In Table 9 we list the hypothesized rules applying to type I and type II alternatives together with their ‘lookalikes’. The same analysis can thus be used for both type I and II: normative forms are analysed as lacking a primary exponent, enabling them to get under the scope of the alternative rules in (6) and (8).

Now we are in the position to tackle the second issue: Why is only one of the alternatives spreading? We argue that the difference with respect to spreading is solely due to a difference in the productivity of the rules: Rule (6) is currently productive, whereas rule (8) is not.

So, the question is how we may explain the difference in productivity between these rules. In order to address this question, we apply Yang’s theory (Yang 2005, 2016) and derive productivity from quantitative differences in the input. Specifically, regarding the effect of region on the spread of the type I alternatives, we predict that its productivity must depend on the distance to the dialect area: only once some alter-

natives enter the input, new productive generalizations are made. In other words, we predict that the rule is productive in regions near the dialect area (where alternative forms occur often), presumably because in such nearby regions the alternative forms are incidentally present in the input. To test this hypothesis and quantify this possible difference in productivity between both rules, we will model them in the following section using the Tolerance Principle (TP) developed by Yang (2005, 2016).

## 4 Productivity

After introducing Yang's Rules-Over-Words approach (ROW hereafter) and explaining the working of the TP, we will apply this theory to the alternative past participles in Frisian in the second part of this section.

### 4.1 *Rules Over Words and the Tolerance Principle*

Yang's ROW approach (2002) proposes a single mechanism view in which rules govern both regular and irregular forms. The theory assumes a default rule to lie at the basis of the regular verbs and makes a sharp distinction between productive and non-productive rules. Where former rule-based approaches (Pinker 1998) use the terms productive and default interchangeably, Yang (2005) distinguishes the two.

(9) Default (definition)

“We take default to mean as a backup option, or ‘when all else fails’. [...] Thus, the default is the maximally general rule possible and its application has no restrictions.” (Yang 2005, p. 272)

(10) Productivity (definition)

“We take productive to mean ‘predictable’ and ‘generalizable’. A rule is productive if it automatically applies to a set of lexical items characterized by certain properties, producing predictable derived forms, and can extend to others, including novel items that have the same properties.” (Yang 2005, p. 272)

The implication of this perspective is that “[...] a productive rule needn't be the default, while the default rule is, by definition, necessarily productive” (2005, p. 273). In fact, a language may have multiple productive rules to mark a particular morpho-syntactic category, and “the existence of a default [...] does not appear to be a hard requirement [...]”. For the Frisian strong and irregular verbs, this distinction means that they may be governed by (multiple) productive rules (and therefore, are not so irregular after all).

Following Anderson (1974), Yang argues that unproductive irregulars are governed by so-called morpholexical rules: “Rules that apply to a fixed list of lexical

items and do not generalize to novel tokens.” (2005, p. 268). To be able to process such irregular forms, the forms themselves do not have to be stored, but the list of lexical items to which a rule applies has to be memorized.

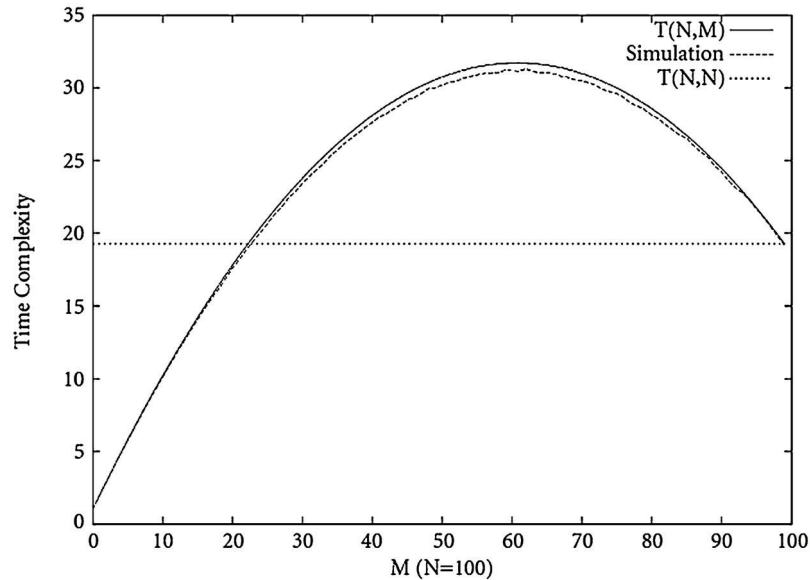
The model described above does not yet tell us when a rule is productive or not. Yang (2005) tries to determine how many exceptions are too many for a rule to take. In order to do so, the price of exceptions has to be determined which in turn asks for a theory of processing. As a psychological model of word processing Yang holds – in line with a long tradition in morphology – that the Elsewhere condition (Kiparsky 1973) governs the organization of morphology. This entails that rules are ordered disjunctively. The default rule applies when all else fails. So, if there are 10 exceptions to a productive rule R, the productive rule only applies to form X after it is determined that X is not listed as one of the 10 exceptions. In terms of the morpholexical and productive rules described above this means that only when all of the morpholexical rules (the exceptions to the productive rule) fail (do not apply to the verb), the productive rule steps in.

- (11) Exceptions and rules, following the Elsewhere principle (simplified)
- Exception 1
  - Exception 2
  - Exception 3
  - etc.
  - Elsewhere: Rule R

This model predicts that exceptions should be processed faster than regular forms because the exceptions come first in the list, and therefore, get assigned a form earlier than the regular ones. Assuming that the language learner wants to be fast and efficient, it is clear that what matters is the time it takes to get to rule R in schema (11). The longer the list of exceptions, the longer it takes for the rule to apply. Therefore, there is a balance between the size of the rule and the size of the exceptions: the larger the scope of a rule is (i.e. the higher its type frequency), the longer the list of exceptions can be because the advantage (the number of verbs the rule may apply to) is bigger.

This lies at the basis of the TP. If it is faster to store all forms (N) than to compute the forms by rule and only store the exceptions (M), all forms will be stored (N,N). If it is not faster, it is more efficient to use the rule R and only store the exceptions (N,M). This is formalized in (12), in which T stands for processing time, N stands for the number of items that fall within the scope of the rule, and M for the number of exceptions to the rule:

- (12) The Tolerance Principle (Yang 2005, p. 281)
- a. If  $T(N,N) < T(N,M)$  then R is morpholexical (N will all be explicitly stored, as if they have nothing in common).
  - b. Otherwise, N is computed by a productive rule R plus a list of M exceptions.



**Fig. 9** Threshold of A (storing all forms N,N) vs. B (Processing N,M). (Yang 2005, p. 283)

**Table 10** The tolerance threshold for rules of varying sizes (Yang 2016, p. 67)

N	Tolerance N/lnN	%
10	4	40%
20	7	35%
50	13	26%
100	23	23%
200	38	19%
500	80	16%
1000	145	14.5%
5000	587	11.7%

But when exactly is it faster to compute the forms by rule? The cost of exceptions is the threshold of (12a) versus (12b), and as Yang calculated it lies at  $N/\ln N$ . The total of  $N$  divided by the natural log of  $N$  is the total number of exceptions the rule can tolerate. So, when  $N$  is 100, as in Fig. 9, processing is only efficient when there are no more than 22 exceptions. If there are more exceptions, one could just as well store all of the forms.

The number of exceptions a rule can take, thus, is the tolerance of the rule. The function  $N/\ln N$  for calculating this tolerance is of course related to the size of a rule's scope and in that way it reflects the relative balance between the size of the rule and the number of possible exceptions. Specific to the function  $N/\ln N$  is that a rule with a small scope can cope with *relatively* more exceptions than a rule with a larger scope, as Table 10 shows. As the size of  $N$  grows, the percentage of exceptions decreases.

This specific feature of the TP also illustrates that the smaller the input is, the higher the chances are of finding a productive rule. This way the TP may account for the advantage of younger children (who have smaller vocabularies) in learning a language. Because the size of the input is dynamic and increases throughout the language acquisition process, the outcome of the tolerance of a specific rule varies accordingly. This is exactly how the TP accounts for overgeneralization patterns.

A question open for discussion is what makes up the effective vocabulary of the learner and what one should use as input to represent this effective vocabulary when studying and applying the TP. Yang (2016, p. 71) argues that such a set should ideally consist of child directed speech, for this resembles the actual input during language acquisition best. Unfortunately, child-directed data is not always available. In such cases Yang proposes that “as a guiding principle, I typically include only words that appear at least once per million as estimated from large-scale corpora”, because they “can be available to most language learners” (2016, p. 71).

## 4.2 *Modeling the Alternatives with the Tolerance Principle*

Because only the type I alternatives spread across the province and the type II alternatives do not, we predict that the type II rule in (8) does not meet the TP, and faces too many exceptions. Rule (6) however is expected to be productive. Because the type I alternatives seem to be spreading outwards from the South-west, we expect that this rule becomes productive as soon as some alternatives are present in the input. This would explain the effect of region: the closer one lives to the South-west, the higher the chance that there are some alternative forms in one’s input, thereby increasing the amount of rule-following items.

### 4.2.1 **Methods**

To apply the above to our Frisian past participles, the tolerance of the rules in (6) and (8) needs to be calculated on the basis of an input set. We constructed a hypothetical input, in which there are no alternatives of type I and II present at all. We did not include the alternative forms, because we wanted to see how many alternative forms in the input would be sufficient to extract a productive rule.

We constructed two versions of the input set, one including all verbs from the most recent Frisian word list (Fryske Akademy 2015) (hereafter: full set), and one including only the 2911 unique simplex verbs from this list (hereafter: simplex set). In their study on learning verbs, Albright and Hayes (2003, p. 132) point out that “a current debate in the acquisition literature (Bybee 1995; Clahsen and Rothweiler 1993; Marcus et al. 1995) concerns whether prefixed forms of the same stem (e.g. do/redo/outdo) should be counted separately for purposes of learning.” If one assumed that they should not be counted separately, they would argue that to the learner they represent more tokens of the same simplex verb rather than completely



different verbs. Therefore, in the simplex set, the prefixed and particle verbs were treated as tokens of the simplex verbs and included in the token frequencies of these verbs.

For both the simplex set and the full set, we listed all verbs that in theory could be under the scope of rules (6) and (8). All other verbs were not of our interest because the TP should be calculated on the scope and hits of the relevant rules.

In line with Yang's perspective on change – happening when language is learned – the sets should ideally consist of child-directed speech. Since there is no such corpus available for Frisian, and because there are no large written or spoken corpora of Frisian available that are representative for present-day spoken Frisian, we turned to the corpus of spoken Dutch (CGN, Nederlandse Taalunie 2004),<sup>9</sup> a large corpus of approximately nine million tokens. In our calculations, we initially included all verbs of which past participles of their Dutch counterparts occur at least once in the CGN corpus.<sup>10</sup> The results show what the effects are of trimming this set down to only words with a certain minimum token frequency.

#### 4.2.2 Results Type I ‘praten’

In (13) the rules for Frisian verbal inflection are given, including the rule for the type I alternatives (6):

- (13) Rules in Frisian, following the Elsewhere principle (simplified)
- |        |  |                          |
|--------|--|--------------------------|
| Rule 6 | / monosyllabic PTCP stems in <i>-t/-d/</i> | <i>-en</i> suffixation   |
| Rule 5 | { <i>lêze, falle, etc</i> }                | <i>-en</i> suffixation   |
|        | ( <i>read, fall</i> )                      |                          |
| Rule 4 |  | <i>-t/-d</i> suffixation |

To find out whether rule (6) meets the Tolerance Principle when there are no alternative forms in the input, we listed all verbs (weak, strong and irregular) with past participle stems ending in *-t* or *-d*, of which their past participle occurs at least once in the CGN. The rule-following items are the strong verbs in *-t* or *-d* which have past participles in *-en*. The exceptions to the rule (M) are the weak verbs in *-t* or *-d* because these are the ones that in a normative situation without alternatives do not get the *-en* suffix but end in *-t* or *-d*.

In Table 11, the results are given for varying input sizes, depending on the minimal token frequency of the verbs. The largest set contains all past participles with a minimal token frequency of 0.1 per million words, the smallest consists of all past participles with a minimal token frequency of 90 per million words. To calculate how many exceptions the rule applying to these different scope sizes can

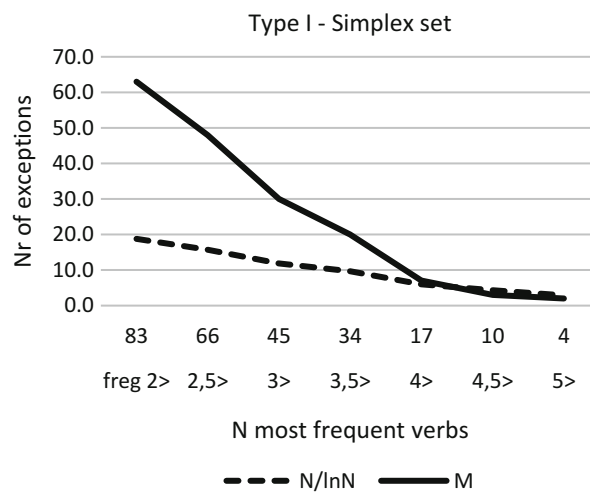
<sup>9</sup>Frisian and Dutch verbal morphology are quite similar, see also the grammar by Popkema (2006) for comparisons.

<sup>10</sup>Note that here we refer to an absolute token frequency of >1 of the respective past participles in the CGN.

**Table 11** Calculation of tolerance of the type I rule (6)

Freq log10zipf <sup>a</sup>	Freq pmw	Simplex set				Full set			
		N	N/lnN	M	Difference	N	N/lnN	M	Difference
2>	> 0,1 pmw	83	18,8	63	+44	254	45,9	143	+97
3>	> 1 pmw	45	11,8	30	+18	108	23,1	63	+40
3,5>	> 3 pmw	34	9,6	20	+10	60	14,7	36	+21
4>	> 9 pmw	17	6,0	7	+1	22	7,12	13	+5,9
4,5>	> 30 pmw	10	4,3	3	-1	9	4,1	4	0
5>	> 90 pmw	4	2,9	2	-1	3	2,73	1	-2

<sup>a</sup>This is the frequency per million words on a zipf scale (Van Heuven et al. 2014).

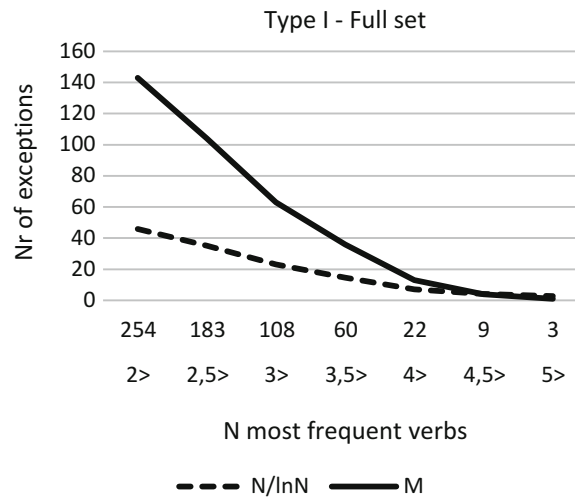


**Fig. 10** Tolerance and exceptions of type I rule (6) – simplex set

tolerate, we divided N by the log of N, resulting in the number of allowed exceptions (N/lnN). Then we counted the actual amount of exceptions (M) and calculated the difference. The table shows that only very little evidence is needed to settle on the productivity of the type I alternative rule. But as N increases and more less frequent verbs are included, M increases as well and in the simplex set, the rule faces too many exceptions at the point where the minimum frequency is 9 pmw and N = 17. In the full set this point comes even earlier, at a minimum frequency of 30 pmw, N = 9.

The graphs in Figs. 10 and 11 illustrate that both the full set and the simplex set follow the same pattern: Only at a quite small vocabulary size the rule meets the TP. This is a consequence of the fact that the rule-following items, the strong verbs in *-t* or *-d* which have past participles in *-en*, are mostly high-frequency verbs. The exceptions are the weak verbs in *-t* or *-d*, and these are mostly the less frequent verbs.

**Fig. 11** Tolerance and exceptions of type I rule (6) – full set



So, although the theory behind the TP clearly gives reason to use a dataset which resembles child-directed speech, the specific selection of verbs on the basis of their frequencies is crucial when testing it. A larger group of verbs may contain more exceptions, and a larger N immediately changes the outcome of the allowed number of exceptions.

The calculations above show that, when there are no alternative forms in the input, the alternative rule adding *-en* only meets the TP when based on quite a small vocabulary. Based on larger scopes, it suffers from too many exceptions to be productive. Now, recall from Sect. 3.2 that when there are no alternative forms in the input, the strong and irregular verbs in *-t/-d* fall under the scope of rule (4) and the alternative rule (6) cannot be extracted. If, through dialect contact, one encounters a certain amount of alternative forms in one's input, the extraction of rule (6) is triggered. The tolerance of this rule is affected by the alternative forms, because they constitute evidence for the rule, and the number of exceptions decreases. Rule (6) then might be able to meet the TP, and this alternative rule actually becomes productive. So, only when some alternative forms are present in the input, can the rule get extracted and become productive. Because the chance of having alternatives in the input increases when one lives close to the dialect region, this explains the spread of the forms outwards from the South-west.

#### 4.2.3 Results Type II 'sjoend'

In (14) again the rules for Frisian verbal inflection are given, this time including the rule for the type II alternatives (8):

**Table 12** Calculation of tolerance of the type II rule (8)

Freq log10zipf	Freq pmw	Simplex set				Full set			
		N	N/lnN	M	Difference	N	N/lnN	M	Difference
2>	0,1 pmw	80	18,3	42	24	433	71,3	366	295
3>	1 pmw	57	14,1	36	22	221	40,9	193	152
3,5>	3 pmw	39	10,6	30	19	132	27,0	119	92
4>	9 pmw	33	9,4	29	20	51	13,0	49	36
4,5>	30 pmw	22	7,1	22	15	13	5,1	13	8
5>	90 pmw	11	4,6	11	6	7	3,6	7	3

- (14) Exception (rule 8) / monosyllabic stems in *-n/* *-d* suffixation  
 Exception (rule 5) {lêze, falle, etc.} *-en* suffixation  
 (read, fall)  
 Elsewhere: (rule 4) *-t/-d* suffixation

The question is whether rule (8) is productive. To calculate its tolerance, we listed all verbs with past participle stems in *-n* of which the past participle occurred at least once in the CGN. The rule following items are the weak verbs with stems in *-n*, which always get the regular *-d* suffix attached to their past participle stems. The exceptions to rule (8) are the strong verbs with their normative past participles in *-n* such as *sjoen* (see.pst.ptcp). Just as for the type I verbs, the results are given for varying input sizes, depending on the selection of verbs (Table 12): The largest set contains all past participles with a minimal token frequency of 0.1 per million words, the smallest consists of all past participles with a minimal token frequency of 90 per million words.

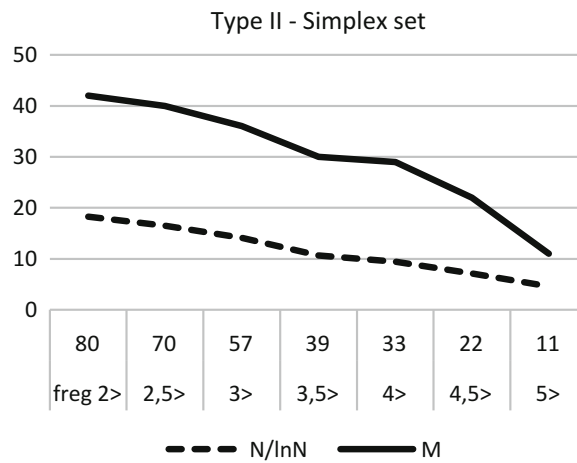
Again, the full set and the simplex set generate similar results. It turns out that in a situation without any alternative forms in the input, the rule for the type II alternatives never reaches productive status. Not in the smallest dataset, where the rule only faces exceptions and no rule-following items at all, and not in the largest dataset in which the balance is 50–50 and the rule faces 40 rule-following items and 42 exceptions. This is illustrated by the graphs in Figs. 12 and 13a, b, in which the continuous line never drops below the dotted line.

Furthermore, only after at least 10 or 20 alternative forms such as *sjoen-d* or *dien-d* have entered the input, the rule could become productive. In conclusion, the TP predicts the rule for the type II alternatives (8) not to become productive, and therefore the type II normative forms to remain unchanged.

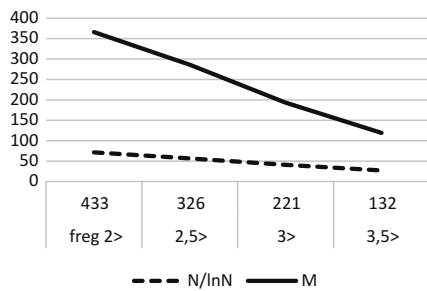
### 4.3 Discussion

Analysing the two alternatives along the lines of the TP has an advantage over a more absolute approach. The results indicate that type I has the potential to become productive, and type II has not. The type I rule is nearly productive when the balance

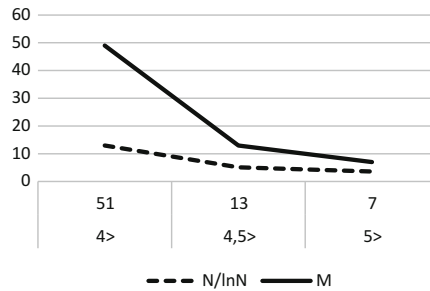
**Fig. 12** Tolerance and exceptions of type II rule (8) – simplex set



**a** Type II - Full set a



**b** Type II - Full set b



**Fig. 13 (a and b):** Tolerance and exceptions of type II rule (8) – full set (13a) beginning (13b) continuation

between rule-following items and exceptions is 50-50. It reaches this balance in the smaller datasets of high-frequency verbs (at the point where  $N = 17$ ,  $M = 7$ ). The type II rule, on the other hand, is nowhere near productive status when it reaches a 50-50 balance, which happens in the large dataset with all verbs occurring at least once ( $N = 80$ ,  $M = 42$ ).

The results also revealed the vulnerability of the approach, in the sense that it depends for a great deal on what one considers to be the effective vocabulary of the language learner. The vocabulary size grows with the age of the learner, but the question is up to what age the learner has access to this productivity measurement.

## 5 Conclusion

The goal of this paper was to answer the question why one type of alternative past participles in Frisian (type I, ‘praten’) spreads successfully over the whole province, whereas the other type of alternatives (type II, ‘sjoend’) does not.<sup>11</sup> We hypothesized that the difference in success between the two alternative past participles must reside in the productivity of their underlying rules, the idea being that people in the rest of the language area would incidentally have Southwestern alternative forms in their inputs, resulting in alternative analyses which may or may not be productive. To test this hypothesis and quantify this possible difference between both rules, we modelled them using the Tolerance Principle developed by Yang (2005, 2016).

The TP correctly predicted the type II alternatives to be productive only when they are maximally present in the input. This implies that, in the dialect region, the forms may be perfectly productive, but they are not likely to spread. For the type I alternatives, the TP showed that the rule has the potential to become productive for people outside the dialect region also. The results indicated that after alternative forms are present in the input, the rule for the type I alternatives can be extracted and can become productive. The Tolerance Principle thus is well suited to model the current distribution of both alternative types and specifically to explain language change in the form of the spreading type I alternatives through productivity and dialect contact.

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<sup>11</sup>The goal of this paper was explicitly not to provide an account of the mere existence of the alternative forms (which would require a separate historical study).

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