

THE REAL-TIME DYNAMICS OF THE INDIVIDUAL AND THE COMMUNITY IN GRAMMATICALIZATION

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Grammaticalization research has led to important insights into the driving processes of innovation and propagation. Yet what has generally been lacking is a principled way of analyzing their interaction. Research into innovation focuses on the role of individual language users and tends to take a more qualitative approach, while propagation is typically studied in terms of the community grammar and tends to be more statistically driven. We propose an approach that bridges the two. Drawing on a much larger historical data set than is commonly done, our study shows how a high-resolution analysis of semantic and morphosyntactic behavior can be married to statistics, resulting in a method that measures the degree of grammaticalization at the level of single attestations. We apply this method to the early grammaticalization of *be going to* INF, showing how a communal increase breaks down into different rates of change in the run-up to, the middle of, and right after conventionalization. Additionally, we trace lifespan change of individual authors longitudinally. While not robustly in evidence, there are hints of postadolescence reanalysis in the run-up generation, and of increased realization of innovative features in the middle generation.*

Keywords: grammaticalization, sociolinguistics, corpus linguistics, reanalysis, language change, innovation and propagation, individual grammars

‘I must confess I think ’twou’d damp my courage,
But when this is the constant language spoke.’
(John Crowne, *The misery of civil-war*, 1680)

1. INTRODUCTION. In this article, we aim at providing a synthesis for two largely distinct traditions in grammaticalization studies, namely the more philologically oriented tradition of analyzing semantic and syntactic changes, and the variationist tradition of analyzing propagation of changes through a community. Using large-scale historical corpus data, we provide a fine-grained quantitative operationalization of the degree of grammaticalization, and also look at generation cohort effects and beyond to what individuals do against the backdrop of communal language change. This operationalization has significant theoretical impact, as it allows us to holistically assess the respective roles of qualitative shifts (such as reanalysis) and frequency increases in a grammaticalization process. Reanalysis and frequency shifts are often treated as separate phenomena in the literature. On the basis of extensive empirical evidence, we argue that a hard distinction is not tenable, and that it is possibly an artefact of existing analytical practices, which tend to be either qualitative or quantitative with a variationist focus.

Though the study of grammaticalization is often assumed to start with Meillet (1912), it only took off in historical linguistics after scholars like T. Givón, Christian Lehmann, Paul Hopper, Elizabeth Closs Traugott, Joan Bybee, and Bernd Heine brought the notion to the fore in the last twenty years of the twentieth century. Since then, it has spawned a mind-boggling number of publications and overviews (see Narrog & Heine 2011). Many studies are mostly qualitative and deal in detail with the intricate form-function changes in a particular element in a particular language, or they provide qualitative evidence of

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crosslinguistically common pathways (Heine & Kuteva 2002), or they try to see how reliable the proposed criteria are for diagnosing grammaticalization (Bybee et al. 1994, Boye & Harder 2012). If quantitative evidence is mustered, it often applies solely to TEXT FREQUENCY. Fine-grained quantitative operationalizations of the DEGREE OF GRAMMATICALIZATION are, to our knowledge, still lacking, some exceptions like Bybee et al. 1994 notwithstanding. This kind of operationalization is not a priori impossible, of course: Lehmann's (2002) parameters of ATTRITION, PARADIGMATIZATION, OBLIGATORIFICATION, CONDENSATION, COALESCENCE, or FIXATION are amenable to quantitative operationalization, but this is hardly ever done in practice. When it is, the historical depth is restricted, and the very first stages of the process remain uncharted, as in Brems (2011), who applies them to rank grammaticalizing quantifiers on a cline, or as in the recent data-driven approach by Saavedra (2019).

Another underdeveloped aspect of the study of grammaticalization is the low sociolinguistic resolution of many grammaticalization studies, even in such well-documented languages as English. When studying the grammaticalization of verbs to auxiliaries, or demonstratives to articles, most researchers do not address issues such as how the purported changes manifest themselves in different members of the society. A massive body of research has shown that grammaticalization patterns are recurrent across languages (see Heine & Kuteva 2002) and even within languages (see van Gelderen 2011 on cyclical change), but it is unclear to what extent grammaticalization patterns are also recurrent across individuals. Yet a community shift in the use of a construction logically implies a sufficient amount of recurrent changes across individuals. A proper theory of grammaticalization can therefore benefit from incorporating an operational view of degrees of grammaticalization down to the level of individual language users.

Recent years have witnessed an upsurge in the attention to individual variation. Dąbrowska (2012) gives an overview of a number of studies showing that there is a huge amount of variation in native-language attainment, and Barlow (2013) demonstrates that individual authors have a detectable fingerprint in their n-grams. This interest in individual variation is being carried over to sociolinguistics and historical linguistics, two fields that have traditionally been more inclined to focus on the aggregate, that is, COMMUNAL, level. Zenner and colleagues (2016), for instance, show that individuals differ on the level of accommodation of sociolectal variables according to their personality, and Guy (2013) makes clear that sociolectal cohesion is commonly overestimated, and that there is considerable individual variation across linguistic variables. If that is the case for sociolinguistics, it is likely to be true for historical linguistics as well. In historical linguistics, individual variation, and more specifically the constraints on it, have lately been studied by Nevalainen and colleagues (2011) and De Smet (2016). These studies do not, however, take a longitudinal perspective, in which individuals are followed through time to see how they shift their behavior, accommodating to or diverging from particular ongoing changes. The few longitudinal studies that we have (Fitzmaurice 2004, Bergs 2005, Raumolin-Brunberg 2009, Hendriks 2013) are typically small-scale. Moreover, large-scale in-depth studies in individual variation focus on competition between two highly entrenched variants. Nevalainen and colleagues (2011), for instance, discuss a number of instances of variation in Early Modern English, but most of these are more morphophonological than syntactic in nature, such as the replacement of the third-person singular ending *-th* by *-s* (*goeth* > *goes*) or the distribution of *my* and *mine*. Some also involve more complex syntactic developments, such as the shift from negative concord (*we cannot see nothing*) to sentential negation (*we cannot see anything*) or the verbalization of the gerund. However, even in these cases only a single dichotomous distinction is

measured (e.g. presence or absence of *of* in the gerund). Moreover, they explicitly exclude the earliest stages of a new variant, stating that the sparsity of data at these early stages defies any quantitative analysis (Nevalainen et al. 2011:7).

The low sociolinguistic resolution of diachronic corpus studies has two obvious causes: first, following the Weinreich, Labov, & Herzog 1968 tradition, most usage-based grammaticalization theorists ‘view language change as minimally a change common to all members of a particular subgroup of a speech community—anything less is merely individual variation, not change’ (Lucas 2015:520). Such a view can be found for instance in Boye and Harder’s authoritative theoretical article on grammaticalization: ‘individual cases of overriding do not in themselves constitute language change (i.e. change in linguistic conventions in the community)’ (Boye & Harder 2012:8). The second cause is more mundane: for many languages, data that could speak to these questions are lacking, and even for English, it is difficult to get hold of the historical data required for such a study. Most grammaticalization scholars would agree with Labov’s (1994:11) trope that ‘historical linguistics can be thought of as the art of making the best use of bad data’. As a consequence, sociolinguistically high-resolution studies of historical change have relied on the APPARENT-TIME METHOD, taking speakers’ age cohorts as a proxy for a time slice. Though in general, the apparent-time method appears to yield good results (Sankoff & Blondeau 2007:582, Tagliamonte & D’Arcy 2009:61), it has a number of obvious drawbacks. First, the availability of informants means that one is restricted to the study of the recent past. Apparent-time studies are mostly concerned with twentieth- or twenty-first-century changes. Second, apparent-time studies may mistake certain changes for something they are not. Variation may reflect age-grading rather than change; sudden events, like changes halting midway, may be missed, and incipient changes may be mistaken for idiosyncrasies (Trudgill 1992:368–70). Third, the apparent-time method might underestimate the rate of change, as it ignores or downplays the participation of older generations in ongoing change. The language use of an eighty-year-old does not necessarily reflect the state of the language when that individual was an adolescent. Adults’ grammars are not diachronically crystallized. If data are available, a real-time study can take this into account.

In this article, we venture an attempt to go beyond what has been done in grammaticalization research so far. Using large-scale historical corpus data, we provide a fine-grained qualitative-quantitative operationalization of the degree of grammaticalization as reflected both in the speech community and within individual language users. We focus on one particular case study: the poster-child of grammaticalization in English, *be going to* INF. Our approach is, however, easily extendable to other case studies.

2. TOWARD AN INTEGRATED THEORY OF GRAMMATICALIZATION. Grammaticalization theory seeks to account for the development of grammatical constructions out of more contentful, lexical material. A comprehensive account of such a process includes a proper understanding of the following aspects:

- (i) The cognitive mechanisms and motivations underlying the creation of new patterns in language use in the individual;
- (ii) The social-psychological mechanisms and motivations underlying the creation or adoption of new patterns in language use in the individual;
- (iii) The mechanisms underlying the propagation at the communal level; and
- (iv) The way (i), (ii), and (iii) interact.

Aspects (i), (ii), and (iii) are ranked from having a focus on the individual to a focus on the communal level. Grammaticalization scholars mostly focus on one of the three.

With regard to (i), a wide array of mechanisms and motivations have been put forward, such as reanalysis (Harris & Campbell 1995, Hopper & Traugott 2003), also and more properly referred to as neoanalysis (Andersen 2001, Traugott & Trousdale 2013), routinization (Haiman 1994, Bybee 2010), analogy (Fischer 2008), ease of effort, economy, and perceptual factors (Fischer 2006). With regard to (ii), there is extensive research on mechanisms like extravagance, that is, the desire to be noticed by others, and the corresponding strategy of being overinformative in expressing grammatical relations (Keller 1994, Haspelmath 1999, Detges & Waltreit 2002), and accommodation, that is, the alignment of speech to that of one's interlocutors (Beuls & Steels 2013). With regard to (iii), there has been modeling work in how variants propagate in a community (Blythe & Croft 2012, Kauhanen 2017).

However, without a proper theory of (iv), any hypotheses on (i)–(iii) run the risk of not being sufficiently constrained and give only very partial results. Various scholars have sensed this and have criticized accounts that rely on just a single dimension. For instance, reanalysis has been criticized for operating in a vacuum and not being sufficiently motivated without additional factors coming into play (e.g. De Smet 2009, 2013). Conversely, the mechanism of analogy has been criticized for not being sufficiently constrained (e.g. Harris & Campbell 1995). Yet most alternatives offered generally do not address (iv) to a satisfactory degree either:¹

- Studies on the early stages of grammaticalization have treated frequency in a coarse-grained way, only quantifying the presence or absence of a grammaticalizing construction and nothing else (e.g. Bybee & McClelland 2005). Studies on more advanced stages of grammaticalization have introduced more sophisticated frequency measures, including multivariate regression analyses taking into account frequencies of different formal and semantic features (e.g. Szmrecsanyi & Hinrichs 2008). However, these studies generally have a variationist focus and do not try to shed light on the issues of innovation (in the sense of neoanalysis) and the entrenchment of innovative features in individuals.
- A more refined view of the role of frequency would mean a proper quantification of the various parameters of grammaticalization (Hopper 1991, Lehmann 2002) that have been proposed in the past. However, these parameters have so far only been discussed conceptually, and have hardly ever been operationalized at a quantitative level (Palander-Collin 1999:119–49 includes frequencies of parameters, but without operationalization in mind; a recent, data-driven attempt is Saavedra 2019). This also holds for the hypothesized importance of SWITCH CONTEXTS, such as the critical contexts identified by Diewald (2006). While Diewald promisingly takes into account (changes in) the context of a grammaticalizing construction, she allots an important role to ambiguity in grammaticalization. In contrast, Traugott and Trousdale (2013:199) question the necessity of ambiguity in the process. Only a systematically quantitative account will be able to decide on the precise role of switch contexts.

¹ This is one of the reasons why some (e.g. Newmeyer 1998:237–40, Campbell 2001) have argued that the grammaticalization framework is not a theory at all. Traugott responded to this kind of criticism (2002:22–27) by pointing out that the creation of a new grammatical function and the increasing effects of further unidirectional change (bonding, phonetic erosion) ARE linked (meaning that grammaticalization is a complex process and not merely an epiphenomenon), but the nature of that link is still not properly understood.

- Grammaticalization studies, while conscientiously drawing the distinction between innovation and change, have often embraced a naive view of what change implies (cf. also De Smet 2013). The traditional view of reanalysis treats change as a punctual, isolated phenomenon in the individual, not embedded in the community (cf. the discussion in Traugott & Trousdale 2010:23), and lacking insight from evolutionary theory. Those studies that do integrate evolutionary modeling of the trajectory of change (Blythe & Croft 2012, Beuls & Steels 2013, Kauhanen 2017) rarely look at first-hand corpus data. By contrast, scholars working on the philological details of actual language change are less concerned with the statistical modeling of trends. There are a few studies that combine those approaches (e.g. Nevalainen et al. 2011), but these are limited to the later stages of the propagation process, after the qualitative changes have already been completed and only need to spread.

To make a strong case for the various differences at various ages and stages in a grammaticalization process, it is necessary to go beyond coarse-grained views on frequency (does a construction occur or not?) and change (has a change taken place or not?) referred to above. In the remainder of this article, we propose a more judicious way of approaching and operationalizing grammaticalization and run the operationalization on an extensive individual-based corpus with regard to the shift of *be going to* INF into a marker of prospective future. The grammaticalization or constructionalization of *be going to* INF consists of a number of smaller subchanges, affecting its semantics as well as its morphosyntax. Because of so-called BRIDGING CONTEXTS (Heine 2002), where the surface structure and/or semantics are ambiguous with regard to a prechange and postchange state, and because of the general nonintrusive nature of constructional changes, proceeding in a sneaky stepwise fashion (De Smet 2012), none of these microchanges in itself constitutes a sufficient condition to consider a given observation as ‘grammaticalized’. This analysis problem has haunted previous grammaticalization studies. Some scholars try to establish a reliable diagnostic by choosing between all of the cues. Boye and Harder (2012), for instance, argue that ‘discursively secondary status’ is the crucial criterion to decide on the status of an element. Unfortunately, this kind of diagnosis relies on tests that can be performed on synchronic data (addressability and topicalization), but hardly on historical data that do not allow permutation tests based on informants’ intuitions. Some attestations may reveal addressability, or conversely, nonaddressability, but many of the cases will be equivocal. Also, such tests will only reveal if a construction has already passed a certain grammaticalization threshold, but will have difficulty in identifying the weight of intermediate stages and in-between cases, which are thereby marginalized instead of fully taken into account.

Instead, we propose a different method for measuring the degree of grammaticalization, by assigning to each instance of *be going to* INF a specific grammaticalization score that takes into account all of the cues, both semantic and morphosyntactic, both at the ‘coding’ and at the ‘behavior’ level (see Haspelmath 2010 for these terms). In other words: each data point receives a ‘grammaticalization score’ for the number of indications of grammaticalization it shows. This score will be our outcome variable in the statistical analyses. A similar procedure has been previously applied by Van de Velde (2009:334–39). A detailed overview of how the variables have been operationalized and the scores assigned is provided in §5. Before we turn to the operationalization details, we first outline the corpus that we compiled to carry out this study (§3) and review the evidence on the grammaticalization of *be going to* INF presented in previous literature and contemporary metalinguistic comments (§4).

3. RESEARCH SETUP.

3.1. THE CORPUS: SIZE MATTERS. It is now possible to overcome size-related limitations of previous studies with the recent completion of a number of massive digitalization projects. Collectively, they unlock an enormous amount of material on an individual level. The collected works of highly prolific authors in our data contain on average over two million words per author. Perhaps surprisingly, to find such an amount of long-term data, we had to base our research not on contemporary material, but on three databases covering the Early Modern English period: *Early English Books Online* (EEBO), *Eighteenth Century Collections Online* (ECCO), and the *Evans Early American Imprint Collection* (Evans). Together, these contain scans of nearly all available British print work that appeared between 1473 and 1800. For the texts that we selected from EEBO and Evans, we made use of the manual transcriptions provided by the Text Creation Partnership (TCP; <http://www.textcreationpartnership.org/>). Corrected transcriptions of the automatic optical character recognition provided by ECCO have been created by a collaborative effort of researchers, students, and volunteers, as part of the compilation of the corpus *Early Modern Multiloquent Authors* (EMMA; cf. Petré et al. 2019),² with the help of <http://www.18thconnect.org/>.

Table 1 provides an overview of the corpus, which has a total size of 74 million words. The corpus consists of thirty-six authors, who had to meet a number of criteria in order to be included. An author was in principle selected only if his or her³ available output amounted to at least 500,000 words spread over a career spanning at least two decades (the average is thirty-six years). A few lesser-represented authors were nevertheless included for genre balance. All authors had to belong to the intellectual elite of the time, and preferably spent a considerable part of their lives in London. Thirty-one of the thirty-six authors selected meet this areal criterion. To meet the output criterion, we had to cast our nets a little more widely by including John Davies (based in Wales), John Flavell (Devon), George Swinnock (Buckinghamshire & Kent), and Increase and Cotton Mather, who lived in New England (Boston). Finally, the work of Biber and colleagues (e.g. Biber & Conrad 2009, Biber & Gray 2013) has amply shown that language use can differ greatly across genres and register. While strictly controlling for these variables would make it nigh impossible to collect robust data, we have tried to balance our corpus broadly in terms of genre. Each generation includes, in principle, four predominantly religious authors, three mostly fictional authors (playwrights, or novelists), one historian, and one scientist (including in the latter category also one legal author, William Prynne).⁴

The individuals were also grouped into generations in order to enable robust analysis of cohort behavior. The delineation of generations started from four natural cohorts. Members of each cohort had to be born within a span of ten years, with another eight years intervening between each generation (generation 1: 1606–1616, generation 2: 1625–1631, generation 3: 1639–1644, generation 4: 1653–1663). For pragmatic reasons, we had to include three outliers in generation 1, and two more in generation 4. These were born some years earlier or later than the target time span.

² Available at <https://www.uantwerpen.be/en/projects/mind-bending-grammars/emma-corpus/>.

³ Only one woman, Aphra Behn, met the criteria for inclusion. As it happens, she was also the first English woman to make a living with her writings.

⁴ Generations 1 and 4 deviate slightly from this schema, with one fictional author less/more and one religious author more/less, respectively.

ID	AUTHOR		GEN	WORDCOUNT	# INSTANCES <i>be going to</i> INF
1	Clarke, Samuel	(1599–1682)	1	2,262,110	17
2	Prynne, William	(1600–1669)	1	5,207,301	11
3	Davenant, Sir William	(1606–1668)	1	527,842	5
4	Fuller, Thomas	(1607–1661)	1	2,648,691	1
5	Milton, John	(1608–1674)	1	729,048	0
6	Baxter, Richard	(1615–1691)	1	11,075,172	46
7	Owen, John	(1616–1683)	1	4,349,249	2
8	L'Estrange, Roger	(1616–1704)	1	2,014,874	34
9	Watson, Thomas	(1620–1686)	1	1,320,914	47
	<i>Total generation 1</i>			<i>30,135,201</i>	
10	Davies, John	(1625–1693)	2	2,974,020	111
11	Patrick, Simon	(1626–1707)	2	3,516,516	115
12	Boyle, Robert	(1627–1691)	2	2,269,454	67
13	Bulsteel, John	(1627–1691)	2	1,052,470	55
14	Swinnock, George	(1627–1673)	2	966,487	27
15	Bunyan, John	(1628–1688)	2	1,411,754	12
16	Flavell, John	(1630–1691)	2	1,627,662	10
17	Dryden, John	(1631–1700)	2	1,229,475	42
18	Phillips, John	(1631–1706)	2	1,476,980	65
	<i>Total generation 2</i>			<i>16,524,818</i>	
19	Mather, Increase	(1639–1723)	3	1,583,566	22
20	Shadwell, Thomas	(1640?–1692)	3	480,244	26
21	Crouch, Nathaniel	(1640?–1725?)	3	1,766,909	29
22	Behn, Aphra	(1640–1689)	3	958,598	52
23	Sherlock, William	(1641–1707)	3	2,017,345	3
24	Horneck, Anthony	(1641–1697)	3	981,971	46
25	Crowne, John	(1641–1712)	3	499,397	24
26	Burnet, Gilbert	(1643–1715)	3	4,976,585	42
27	Salmon, William	(1644–1713)	3	2,896,330	6
	<i>Total generation 3</i>			<i>16,160,945</i>	
28	D'Urfey, Thomas	(1653–1723)	4	1,118,642	66
29	Ravenscroft, Edward	(1654?–1707)	4	294,875	35
30	Dennis, John	(1657–1734)	4	716,210	10
31	Wake, William	(1657–1737)	4	1,261,359	2
32	Dunton, John	(1659–1733)	4	1,491,068	51
33	Defoe, Daniel	(1660–1731)	4	3,160,776	132
34	Mather, Cotton	(1663–1728)	4	2,494,709	140
35	Harris, John	(1666–1719)	4	288,784	10
36	Whiston, William	(1667–1752)	4	533,240	6
	<i>Total generation 4</i>			<i>11,359,663</i>	
	Total			74,180,627	1,369

TABLE 1. Sample size per author (ordered by birthdate) and generation.

From Table 1 it can be appreciated that the majority of the authors we included produced more than ten and up to 140 instances of *be going to* INF (with an overall average of 37.5), which enables us to go beyond intergenerational change and also analyze intraindividual change. Authors for whom we found ten or fewer instances are still included, as they also contributed to the communal language profile to which each author was exposed. They are, however, excluded in quantitative analyses at the individual level.

Our sample is, of course, not representative of the Early Modern English-speaking world. For one thing, prolific authors are likely to be influenced more by written language than most other people. Yet the selection of authors with highly comparable pro-

files and whose output allows for a high-resolution analysis should nevertheless enable us to see some general trends, setting a standard to be tested on other populations and case studies.

3.2. DATA EXTRACTION. As a preparatory step, the original transcriptions were first preprocessed (with Perl scripts) to make data extraction as accurate as possible.⁵ To extract data from the preprocessed texts we also made use of Perl scripts. Because in this early stage of its grammaticalization it is important not to miss a single instance of *be going to* INF, we decided to start with a very general search on all forms of *going*. This search yielded more than 10,000 results, with the spellings *going*, *a going*, *a-going*, *agoing*, *gowing*, and *goin* (twice, probably typos). Tokens with illegible letters (represented by an underscore, e.g. *g_ing*) were included as well. The results were then filtered for those cases that cooccurred with a form of *be* and a *to*-infinitive. *To*-infinitives were found up to twelve words after *going*, illustrating that a traditional approach with a certain context window (typically three to five words) would have overlooked quite a few instances.

After having filtered out all combinations of *be*, *going*, and a *to*-infinitive, a second round of clean-up was carried out. First we excluded instances where the verb *go* was part of a lexicalized phrasal verb with a meaning of its own. The most frequent ones were *go on* ‘continue’ and *go about* ‘wander about’. Others include, for instance, *go off* in the sense of ‘being triggered’ (*the alarm clock went off*). The first two in particular are often combined with a *to*-infinitive. *Go about to* INF even shows grammaticalized behavior itself, with a related but perhaps somewhat less future-oriented function. We decided not to include it, because the particle *about* makes the construction clearly formally distinct. Second, we excluded nominal uses of *be going to* INF, which are only superficially similar to progressive *be going*. An example is 1, in which the *to*-infinitive functions as the predicate of *be* (‘they think to go up is going downward’).

- (1) The World believe not this, they think ’tis going downward to go up to the house of God, but they are in a horrible mistake. (Bunyan, 1688; generation 2)

In the end, we collected 1,369 valid instances, distributed over the various authors as indicated in Table 1. All data (KWIC + analysis) are available open access at <https://hdl.handle.net/10067/1541150151162165141>. Metadata are available at <https://hdl.handle.net/10067/1541160151162165141>.

4. TIMING AND NATURE OF THE CHANGES. To assess the microchanges that target specific parts of the construction, we have turned to the extensive literature on the grammaticalization of *be going to* INF, including, within the past ten years, Hilpert 2008, Disney 2009, Nesselhauf 2010, Garrett 2012, Traugott 2012, 2015, Traugott & Trousdale 2013, Budts & Petré 2016, Petré 2016a, 2019. This section discusses some of the important insights and advances in this literature, in order to justify the operationalization we propose in the next. The section also presents some new findings on the timing of the conventionalization of *be going to* INF to refer to imminent future, as this allows us to closely relate the quantitative analysis to what is going on in the wider speech community of the time.

The source of *be going to* INF was a fully compositional combination expressing physical motion plus a purposive nonfinite clause, represented in the construction

⁵ Preprocessing mainly involved correct tokenization of the corpus. For instance, end-of-line hyphens were removed; xml-tags representing illegible glyphs were replaced by underscores; notes were stored in separate files. Everything that did not belong to the actual running text (additional xml-tags, pagination, etc.) was either removed or ignored in the searches and word counts.

grammar formalization in 2, with double arrows dividing the form and the function of the constructions involved (see e.g. Traugott & Trousdale 2013). An early instance of this source construction is given in 3.

- (2) [[BE *Ving*] ↔ [imperfectivity/ongoingness]] + [[*go*] ↔ [allative motion]] + [[*to* INF] ↔ [purpose adjunct]]
- (3) As he **was goyng** to Priscouia **to mete** Sigismundus themperoure, he was by the way sodenlye taken wyth the pestilence, and so made he an ende of hys cursed life. (1554, An exhortation to all menne to take hede ...)

In the course of its grammaticalization process, *be going to* INF acquired characteristics of an auxiliary, and the purposive adjunct (*to buy some chocolate* in 4) was neoanalyzed as its complement, as in 5.

- (4) [I am going] [to buy some chocolate] >
- (5) [I am going to buy some chocolate]

The literature has extensively discussed a number of aspects that are involved in bringing about this neoanalysis of *be going to* INF. Of particular relevance are first attestations and evidence of early semantic and syntactic changes.

The chronology of the early changes has remained contentious to some extent. Early studies tended to situate the start of the grammaticalization process too early. Danchev and Kytö (1994:61), discarding Mossé's (1938:§290) spurious claim that the first example dated from the early fourteenth century, draw attention to a phrase from 1438, reading *the seid persones of the ship of Hull goyng to do the said wrong*. However, this is also not an instance of *be going to* INF, but of the free adjunct *goyng* combined with a *to*-infinitive. More importantly, the wider context (which Danchev and Kytö do not provide) makes it clear that the *seid persones* actually *rode downe to the seid shippes* (Fisher et al. 1984:174), showing that *goyng* refers to 'going on horseback to their ship'. Therefore, the instance does not contain any evidence that *goyng* itself had lost its sense of motion and was associated with a sense of futurity—only the purposive adjunct (the *to*-infinitive) is.

Danchev and Kytö mention a second fifteenth-century example, given here as 6.

- (6) Thys onhappy sowle ... **was goyng to be broughte** into helle for the synne and onleful [unlawful] lustys of her body. (1482, Monk of Evesham; *OED* go 47b)

Hopper and Traugott (1993:83, 2003:89) already observed that, while 6 is linked to motion in a worldview where a soul goes on a journey to the afterlife, the passive demotes the notion of control associated with lexical *go*. In addition, the embedding of the goal in the infinitival clause demotes its directionality. The potential overall effect is a promotion of the notion of futurity. While this idea of semantic redistribution is plausible, the sentence as such does not provide any conclusive evidence that it had taken place. At most, the example shows that the opportunity is there.

The absence of the semantic feature of MOTION has been proposed as more clear-cut evidence of semantic redistribution and, hence, grammaticalized behavior. Danchev and Kytö (1994:67) draw attention to a Latin school grammar published in 1646, where the Latin future suffix *-rus* is explicitly equated with *about to*, or *going to*, and the example *I am about to or going to read* is given (Poole 1646:26). The equation of *about to* and *going to* strongly suggests that motion is no longer an inherent property of *be going to* INF, and also that the grammaticalized construction had already conventionalized to the extent that it was natural to include it in a grammar book for general use. Combining this evidence with an overview of early examples in the Helsinki Corpus, Danchev and Kytö come to the conclusion that grammaticalization of *be going to* INF 'may have set in before the middle of the seventeenth century' (1994:69).

Garrett (2012), drawing on the far greater database provided by EEBO, identifies the occurrence in 7, dated 1611, as the earliest attestation where motion is lacking.

- (7) The Gentleman tooke the dog in shagge-haire to be some Watch-man in a rugge gowne; and swore hee would hang mee vp at the next doore with my lanthorne in my hand, that passengers might see their way as they went without rubbing against Gentlemens shinnes. So, for want of a Cord, hee tooke his owne garters off; and as he **was going to make a nooze**, I watch'd my time and ranne away. (1611)

Yet, while it is possible that the anonymous *Gentleman* converts his garters into a hanging device on the spot, the writer may well have had in mind for the gentleman to walk to this *next doore* mentioned in the previous sentence, to attach his garters there as a noose. Many doors at the time had a sign or emblem above them that was ideally suited for hanging someone. It appears that one has to be very careful in assigning a label 'no motion', if one wants to avoid anachronistic interpretations.

Another piece of evidence to narrow down the timing of the emergence of a grammatical function in *be going to* INF is provided by Traugott and Trousdale (2013:221). They quote a passage from Henry Ainsworth's commentary on the Old Testament, dated 1639. However, they are quoting a posthumous reprint, as Ainsworth died in 1622 (Moody 2004). The first edition dates from 1616. It is provided in 8, and the Old Testament passage to which it applies is given in 9.

- (8) V. 32. *going to dye*] that is, *ready*, or *in danger to dye*: which may be meant, both in respect of his present hunger, which could not (as he profanely thought) be satisfied vwith the title of his birth-right: and of his daily danger to be kylled by the wild beasts, in the feild where he hunted.

(Ainsworth, 1616, *Annotations upon the five bookes of Moses*; EEBO ID 99836309, image 81)

- (9) Loe I *am going to dye*: and wherfore (*serveth*) this first birthright unto me? (ibid., image 79)

Traugott and Trousdale take 8 to mean that *be going to* INF is used here as a marker of futurity rather than a motion verb. Indeed, the context of imminent death seems to have little to do with motion. However, scrutiny of the contemporary evidence suggests a different story. Published in 1611, the King James Version, for instance, runs as follows.

- (10) And Esau said, Behold, I am† at the point to die: and what profit shall this birthright doe to me? (1611, *The Holy Bible conteyning the Old Testament, and the New*; EEBO ID 99857498, image 53)

The dagger refers to a note '*Hebr. going to die*'. The actual Hebrew verb form reads הֹלֵךְ (*hō-w-lēk*) (Salisbury 2016), which is a participial form of a verb meaning 'go, walk' (Arnold & Choi 2003). A literal translation would be 'I going to die'. Interestingly, the idea of motion is quite strong in this Hebrew verb. Yet the Latin Vulgate, the version that most humanists knew best, simply has *morior* 'I am dying'. Shedding motion in the translation is not surprising, since nothing in the context points to it. The translators of the King James Bible may have thought along the same lines. Their decision suggests that the use of *be going to* INF where motion was seemingly absent was still unconventional in 1611. While Ainsworth's translation might be seen as an indication that this had changed by 1616, this is arguably not the most likely interpretation. Instead, we assume that Ainsworth wanted to be as faithful as possible to the Hebrew original. His comment, then, rather than pointing to the conventionalization of futurity, betrays that some explanation was required precisely because the phrase was NOT expected in English. Being a knowledgeable Hebrew scholar, he knew that the Hebrew verb required a motion reading. He provides such an interpretation by raising the sug-

gestion that Esau, who is a hunter by profession, is hinting at his risky daily trips into the wilderness. At the same time, Ainsworth's gloss *ready to die* seems to allow for a nonmotion reading as well, which may mean motionless uses of *be going to* INF were indeed around.

Assuming this is true, the date of conventionalization of the future semantics of *be going to* INF probably lies somewhere between 1616 and 1646 at the latest. Since the 1616 quote betrays uneasiness with motionless *be going to* INF, it seems reasonable that its conventionalization only becomes fact some years later. And since it is unlikely that a school grammar would be keen on including an expression that is brand-new, conventionalization most likely preceded 1646 by a number of years. We therefore assume that conventionalization occurred between 1620 and 1640. This is exactly the period in which our generation 1 had fully acquired language (with the possible exception of Thomas Watson), and generation 2 was acquiring it. It also means that our data may capture the very early stages of the grammaticalization process, that is, the shift from first innovative steps to propagation.

Until the end of the seventeenth century, the use of *be going to* INF was still largely restricted to express imminent future (Traugott 2015:67), as well as intentional actions (Budts & Petré 2016). According to Traugott (2015:69), the latest possible date when the new analysis in 5 is the only one available is the early eighteenth century, when sentences appear of the type in 11, where *go* no longer has a subject of its own and therefore can only be considered an auxiliary.

(11) There **is going to be** such a calm among us. (1725)

The neoanalysis paves the way for the later coalescence of *going* and *to*, which have now become two parts of a complex auxiliary. However, this is a later process (first attested in writing in 1806; see *OED*, s.v. *gonna*⁶), which seems to be contemporary with the extension from imminent to nonimminent future, among other developments (see e.g. Budts & Petré 2016).⁷ We are not concerned here with these later developments, as we consider the development up to the emergence of raising as constituting an independent (first) GRAMMATICALIZATION EPISODE, a term that is to be understood as encompassing a distinct coherent grammatical change (here from motion with a purpose to imminent future), which potentially (as in this case) forms part of a long-term multi-episode grammaticalization process. This is also the reason why we do not look at competition with *will* (studied in e.g. Tagliamonte, Durham, & Smith 2014), as this competition also only takes off once *be going to* INF had changed further to include a wider range of futures.

In addition to the timing of the grammaticalization process, the literature is rich in attempts to explain how neoanalysis was enabled. Hopper and Traugott (1993, 2003) refer to the concept of semantic redistribution, which is similar to Croft's notion of form-function reanalysis (2000:117). The underlying idea is that meaning primarily resides in utterances holistically. This holistic dimension creates ample room for reassignment of semantic components. *Be going to* INF may have been particularly prone to such reinterpretations. Disney (2009) argues that the string *be going to* INF evokes a number of semantic features, which could be activated or not in specific utterances. Petré (2019) elaborates on this idea by recasting the grammaticalization of *be going to*

⁶ 'gonna, v.' *Oxford English Dictionary Online*. Oxford University Press, March 2018. Online: www.oed.com/view/Entry/79914.

⁷ Another development that the literature refers to as of later date is that of the use of states (*I'm going to be happy*) with the construction (cf. Hilpert 2008). There are some early instances of states in our data, which may be sensibly included in future analyses.

INF in Langackerian terms of (de)profiling. Hopper and Traugott's (2003) analysis of the passive example in 6 takes the same perspective. The idea that a verb such as *go* lends itself well for grammaticalization is intuitive. People go to a place with a purpose. The going itself is generally of secondary importance. The fact that contexts in which *go* is used with a purposive adjunct may often downplay the importance of motion provides a good starting point for a quantitative analysis, assuming that one swallow does not make a summer. Our analysis will reveal that some contexts that facilitate semantic redistribution seem to have weighed more than others, and that structure has a role to play beyond that of structural ambiguity.

5. OPERATIONALIZING DEGREES OF GRAMMATICALIZATION. The change from source to target construction is accompanied—or more accurately: realized—by a number of small constructional changes. As was explained above, we scored all data points for the number of features, or symptoms, of constructional change it shows—every symptom receives a score of 1 and scores are standardized afterward. We then use this score to get an idea of how far the grammaticalization has proceeded. Most of these symptoms have previously been linked to the grammaticalization of *be going to* INF, but the feature of FRONTING is applied to this case for the first time. Fronting appears to be an early syntactic feature that strongly correlates with grammaticalized uses of *be going to* INF. In the analysis, we looked both at the behavior of each feature separately and at their combined value (by computing a summative measure), which allows us to pick up on small increments in the level of grammaticalization.

We first discuss the syntactic features (§5.1) and then the semantic ones (§5.2), and conclude with a summary overview (§5.3). We believe it is absolutely necessary to be explicit about our methods because of the inherent role of quantification in our integrated view on grammaticalization. For readers that are mostly interested in the general results and how they support our model, a brief perusal of the summary (§5.3) may suffice to understand the results in §6.

5.1. SYNTACTIC FEATURES.

(i) ADJACENCY. The first feature is that of adjacency, as in 12, a syntactic feature related to Lehmann's parameter of BONDEDNESS (Lehmann 2002:131–32). Adjacent instances are distinguished from nonadjacent ones such as 13.

(12) I am going \emptyset to buy me a pretty convenient Coach, what Colour do you fancy, dear Mrs. Gatty? (Shadwell, 1679; generation 3)

(13) He's going **now** to see some fresher beauties. (Behn, 1671; generation 3)

The assumption is that adjacent instances pave the way for the coalescence of *going* and *to*. That said, the first known attestation of the merged form *gonna* dates from much later, namely 1806. While possibly earlier in spoken language, this late date seems to indicate that adjacency did not yet play a role in the first grammaticalization episode investigated here. Our results (in §6) also confirm this.

(ii) FRONTING. A symptom that has occasionally been discussed in studies on auxili-ation (Krug 2000:97 on English *have (got) to*, Hilpert & Koops 2008:250 on Swedish *sitta*), but which has not yet been considered in the case of *be going to* INF, is that of fronting of arguments or adjuncts belonging to the infinitival clause. Fronting includes relativization, as in 14, or obligatory fronting of question words, as in 15. Examples 12–13 above illustrate nonfronted instances.

(14) I'll think of nothing but thee at present, and **the Heaven** I am going to enjoy. (Ravenscroft, 1682; generation 4)

(15) Dear, **what** am I going to do? (Crowne, 1675; generation 3)

All instances have in common that an element that notionally belongs to the embedded infinitival clause is topicalized and as such becomes part of the matrix clause that features *be going*. Each case of fronting received a score of 1. The assumption is that topicalization invites the interpretation of the expression as being primarily about the imminent action (encoded by the infinitival phrase), with the motion itself being backgrounded. We take this to indicate that *be going to* INF has moved on along the cline of auxiliiation. In line with Boye and Harder's notion of addressability (2007:581–87, 2012), *going* may be said to be less addressable than in cases without fronting. If *going* still belongs to the propositional content (is addressable), this 'discursively primary' use could be probed by elliptical questions. This works with 13, where you could say *Is he going now?*, but hardly with 14–15, where *going* already belongs to the secondary material.

(iii) VOICE. In line with Traugott and Trousdale (2013:220), we assume that the passive potentially impacts the reading of *go* (cf. also §4). Using the passive demotes agency with respect to the infinitive, but (some) hearers (at least) may have inferred from this that it also demotes the controlled action of *going* more generally. It is, for instance, likely that such an inference is made in 16, where the martyr who is announcing his impending death is describing his fate, over which he no longer has any control (even though he still controls his feet).

- (16) Then he prayed, and so went into his Cabin made with fagots, saying to the people, I **am now going to be sacrificed**; Follow you me when God of his goodnesse shall call you to it: and so he was first strangled, and then burnt to ashes. (Clarke, 1660; generation 1)

Note that the use of the passive is not considered to be direct evidence of a higher degree of grammaticalization. Rather, its use is assumed to strongly correlate to an underlying variable of lack of control over the composite action by the subject. Lack of control fits the grammaticalized meaning of futurity, but is at odds with the lexical meaning of *go*. Under this assumption, the use of the passive received a score of 1. There are, nevertheless, several cases in which its use does not correlate with lack of control. The most typical one is illustrated in 17.

- (17) Brethren, I **am now going to be married** (Clarke, 1660; generation 1)

While lack of control is the primary variable, because of the interpretative difficulties involved, we have only coded the instances for the correlating variables of voice and animacy, whose assignment is less subjective.

(iv) OTHER STRUCTURAL FEATURES. This heading collects some rarer structural symptoms, which nevertheless are clear indications of grammaticalized usage, and therefore were all positively scored. The first two of these do not, as far as we know, appear in previous studies, most likely owing to the lack of a sizable corpus.

a. PARENTHETICALS are generally considered to be more grammatical uses of less grammatical source constructions (cf. Thompson & Mulac 1991, Boye & Harder 2007: 579) and accordingly received a score of 1. Their specific grammatical function is an epistemic one of qualifying the contents of the entire clause in which they appear. As such, they bear similarities to epistemic sentence adverbs such as *probably*. Boye and Harder (2007:579) show that they share their distribution with such adverbs: unlike proper matrix clauses, which start the sentence, they can also appear medially or finally. They no longer convey propositional content, as is typical for pregrammaticalized main-clause use. For instance, their content cannot normally be addressed by replies like *Really?*. In 18, such a reply would address the clause *he hates Vice* instead.

(18) He's what we may truly call a Religious Printer, (and **I was going to say**) he hates Vice. (Dunton, 1699; generation 4)

b. COORDINATION with an existing aspectual auxiliary is also taken to indicate a higher degree of grammaticalization.

(19) It may perhaps illustrate what I **have been saying** and **am going to say**, about the several Classes of Titles ... (Boyle, 1683; generation 2)

c. RAISING. Traugott (2015:69) takes raising to be a syntactic actualization of the neoanalysis of *be going to* INF as an auxiliary construction. Only a single instance of raising was found in our data. It is notable, nevertheless, that this instance predates the one given by Traugott by more than thirty years.⁸

(20) ... , when **there was going to be** God manifest in the Flesh (Cotton Mather, 1694; generation 4)

d. INFINITIVE IS *GO*. *To go*-complements are positively scored, as it would be strange to use *go* again if the *to*-infinitive is an adjunct clause combining with allative *go*. Moreover, the pattern with double *go* violates the *horror aequi* tendency, an aversion to double expression on the part of the language user, which is a pervasive force in language use (see, among others, Rohdenburg 2003).

(21) If a Contention should **be going to go** to Begin, Oh! let it be left off before 'tis Begun. (Cotton Mather, 1727; generation 4)

5.2. SEMANTIC FEATURES.

(v) GOAL (OR SOURCE). The absence of a spatial goal (or source) (as in all examples given in §5.1) is another easily identifiable feature that can be assumed to correlate with grammaticalized status, as the explicit expression of a goal (or source) argument (as in 22) precludes the auxiliary reading. This is a one-way relation: the absence of a goal does not preclude the old lexical reading. It is, however, precisely to compensate for indeterminate cases such as these that we use summative scores to assess the degree of grammaticalization. Instances were positively scored for absence of goal also if the goal argument is embedded in the *to*-infinitive, as in 23, which means that an auxiliary reading is less easy to dismiss.

(22) Sir, I am just now going **to a Lawyer of the Temple** to aske his Councill. (Shadwell, 1668; generation 3)

(23) ... Baron Iohn Skytte, who was then going to build a little Citie **there**. (Davies, 1669; generation 2)

(vi) MOTION. As discussed in §4, the extension beyond contexts of spatial motion constitutes a hallmark in the emergence of a grammatical construction *be going to* INF. Whenever motion was clearly present, either because a goal was expressed or because the wider co-text made it clear that those involved were on the move (as in 24), a score of 0 was assigned. This also includes the motion of the soul's journey to the afterlife, as in the early instance 6 given in §4.

⁸ One might object that this example is different from the one given by Traugott (i.e. example 11). The one from 1694 has a definite subject with a subject complement, while the one from 1725 bears more similarity to an existential construction. The first may easily be paraphrased as *God was going to be manifest in the Flesh*, restoring the subject of *go*. However, the same arguably applies to the other example: *Such a calm is going to be among us*. We believe this paraphrasability only shows that even hallmarks of neoanalysis are tied to pre-neoanalysis realizations by similarity relations.

(24) (Const.) We are undon, yonder's the High Constable going the Rounds to Night! haste every one to his Post—

[*Ex. Const. and Watch.*

Enter Sir Nicholas Peakgoose.]

(Sir Chr.) **Who's here** [= said to someone arriving, so in motion—*PP/FVdV*], Sir Nicholas Peakgoose! i'faith thou shalt roar and sing, and break Windows—

(Sir Nich.) Not for the world, Gentlemen; I **am going to fetch** my Celia from Sir Humphrey's house [= indication of goal, but in embedded clause—*PP/FVdV*], if she find me in drink, she'll be outrageous.

(Sir Chr.) Gad you shall: hang sneaking after a Whore; Keep her under.

(Shadwell, 1680; generation 3)

All other instances, where it was either no longer possible to read motion into them (as in 25) or where it was impossible to determine whether motion was intended (26), received a score of 1.

(25) Death! Just as I **was going to be damnably in Love**, to have her led off!

(Behn, 1677; generation 3)

(26) Y'gad Madam I have got no money about me, I had damn'd ill luck at play, but I **am going to receive** some this Afternoon, and if you'l let me know where I shall be so happy as to meet you anon in the Evening, you shall find none more a Gentleman—

(Ravenscroft, 1673; generation 4)

In 26, either the speaker will go somewhere to receive some money (motion), or he expects to receive it right where he is (no motion). It is plausible that earlier instances still referred to motion more often than later ones. We cannot read the intentions of the writers, so any such development remains hidden. Yet even indeterminate cases that originally were intended as motional must have played a facilitating role in the overall development. Motion is pushed to the background in such uses, and there are no impediments for the hearer/reader to infer the absence of such motion (cf. Traugott 2010:32 on the importance of invited inferences in semantic change).

(vii) ANIMACY. Similar to the syntactic feature of voice, the semantic feature of animacy is a more easily quantifiable index of the more subjective underlying factor of control. The main verb *go* when referring to motion requires the subject to be in control of that motion. Therefore, all inanimate subjects that are not personifications, such as the *hot Fit* in 27, have been scored positively.

(27) Oh! the hot **Fit's going to begin** I see.

(D'Urfey, 1709; generation 4)

(viii) PREDICTIVENESS. A final semantic difference between *be going to* INF pre- and postauxiliation is that the lexical use is essentially descriptive. As such it takes an egophoric perspective (in the sense of Dahl 2008), meaning that it is limited to expressions in which, for a number of reasons, no one is better equipped than the speaker/writer to make this particular statement about the future (for an earlier view, see Budts & Petré 2016). If in the past tense, both the situation relative to which the infinitival event was future and the infinitival event itself are situated in the past from the point of view of the speaker (cf. also Traugott 1989). The speaker/writer in such cases does not actually predict anything. Neither does the use of the present tense, which means that the future event has not yet been realized, automatically imply that the utterance is a prediction about an unknown contingent event. Specifically, the egophoric perspective still holds, when: (i) The expression is generic and represents a statement about the future that will not be contested by the speech community. This category includes statements on the soul's journey

to the gates of heaven, because these instantiate a shared worldview and are not predictions on the contingent event of dying itself. (ii) The expression is in the present tense, but about the speaker's own intentions or experience, which nobody knows better than the speaker. (iii) The expression is nondeclarative and does not commit itself with regard to the realization of the future situation. All of these cases received a score of 0. A score of 0 was also assigned when a speaker/writer reports on somebody else's intentions second-handedly (with or without reference to the source), as in 28. While the report may be based on faulty sources, the speaker does not intend to make a prediction, and the statement may be equated to an egophoric one on that account.

(28) **To tell you true Sir, he's going to see** a Lady that he's in Love with.

(Dryden, 1690; generation 2)

Scores of 1 were only assigned to personal assessments about somebody or something else's imminent actions by means of external evidence (evidential uses), as in 27 or 29, where *see* can be taken to refer to visible evidence forestalling the future situation, or in the case of unqualified predictions (such as 11).

(29) Oh, he now bids the Counsel speak by their Interpreter, and give their Reasons, first why the Plaintiff accuses ye for Men; and **see he is going to answer**.

(D'Urfey, 1706; generation 4)

Increased occurrence of such statements is assumed to point to the emergence of an epistemic layer of prediction in the semantics of *be going to* INF.

5.3. SUMMARY. Table 2 provides an overview of how every value of each feature has been scored. It also shows that, in theory, the maximum score is 8 (under the assumption that the syntactic diagnostics taken together under OTHER do not cooccur).

TYPE	FEATURE	EXAMPLE	VALUE [SCORE]
SYNTACTIC	ADJACENCY	He's going (now) to see some fresher beauties.	nonadjacent [0]; adjacent [1]
	FRONTING	that barbarous action he was going to commit.	no [0]; yes [1]
	VOICE	Are not you going to be married ?	active [0]; passive [1]
	OTHER	If a Contention should be going to go to Begin	parenthetical [1]; coordination with AUX [1]; raising [1]; <i>go</i> -INF [1]
SEMANTIC	GOAL	I am just now going to a Lawyer to aske ...	goal with INF [0]; embedded [1]; only infinitive [1]
	MOTION	I was going to be damnably in Love .	motion [0]; metaphorical motion [0]; indeterminate [1]; no motion [1]
	ANIMACY	Examples which are now going to be Familiar.	animate [0]; inanimate [1]
	PREDICTIVENESS	the Devil is going to be Dislodged ... God will ... cause him to fall.	egophoric [0]; reportative [0]; predictive [1]

TABLE 2. Overview of feature scores.

Given the diversity of the criteria, no data point will score positive on all features. Still, overall, we have a wide range, with summative scores between 0 and 7 (mean = 3.0, median = 3.0, *SD* = 1.2). The histogram of the summed raw scores in Figure 1 gives an idea of the overall distribution of the observations.⁹

⁹ Data preparation and statistical analysis have been carried out with open-access software, R version 3.4.0 (R Core Team 2017). The following packages were used: stringr (Wickham 2017), dplyr (Wickham & François 2015), ggplot2 (Wickham 2009), ggrepel (Slowikowski 2017), lme4 (Bates et al. 2015), MASS (Venables & Ripley 2002), car (Fox & Weisberg 2011), nlme (Pinheiro et al. 2017), MuMIn (Bartón 2016), lmttest

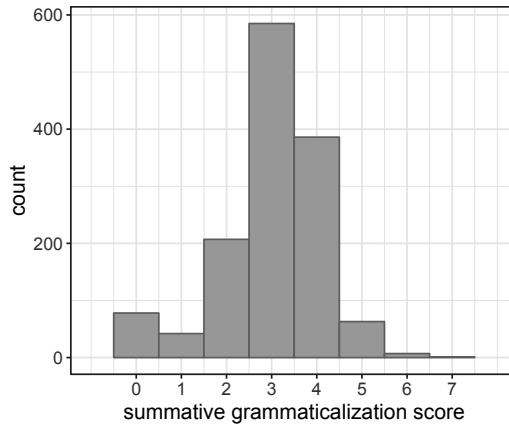


FIGURE 1. Histogram of summed raw grammaticalization scores.

We checked to what extent the scores of all these features are correlated. A high correlation could be an indication that there is multicollinearity. This turns out not to be the case. The overall correlation between the features is low. The only correlation higher than 0.5 is found between ADJACENCY and the (absence of a) GOAL (Pearson correlation 0.72, $p < 0.0001$). Inevitably, this eight-point scale is somewhat idiosyncratic, as it depends on the grammaticalization symptoms that we happen to investigate for this particular case study. To reduce this idiosyncrasy, we standardized all scores by subtracting the mean and then dividing by the standard deviation.

We are now in the position to detect some key trends. Does the overall score of attestations of *be going to* INF increase with time? And what is the individual speakers' behavior against the backdrop of this communal change? These questions are addressed in the following section.

6. RESULTS. In this section we elaborate on several statistical measures to interpret the results we obtained. We first discuss the interpretation of the aggregate results. From these aggregate results it becomes clear that there is a significant increase in the average degree of grammaticalization of instances of *be going to* INF over the relatively short time span examined. This result is in conformity with the idea of gradual propagation through the speech community, but it does not actually tell us much about the other dynamics within and between individuals and their interaction (cf. §2). In order to shed more light on these aspects we proceed in a second part of this section to a detailed analysis of cohort effects as well as intraindividual developments. From this analysis it appears that individuals from different generations behave differently above and beyond the changes at the aggregate level.

6.1. AGGREGATE RESULTS. Figure 2 gives an overview of the aggregated data. Each data point has a standardized summative grammaticalization score, based on the features discussed in the previous section. Scores are set on the y-axis. The x-axis represents the date of attestation. We used different shapes for the four generations, and the jitter function to add random noise in order to avoid overplotting of the symbols.

(Zeileis & Hothorn 2002), effects (Fox 2003), corrgram (Wright 2015), vcd (Meyer et al. 2015), pwr (Champany 2015).

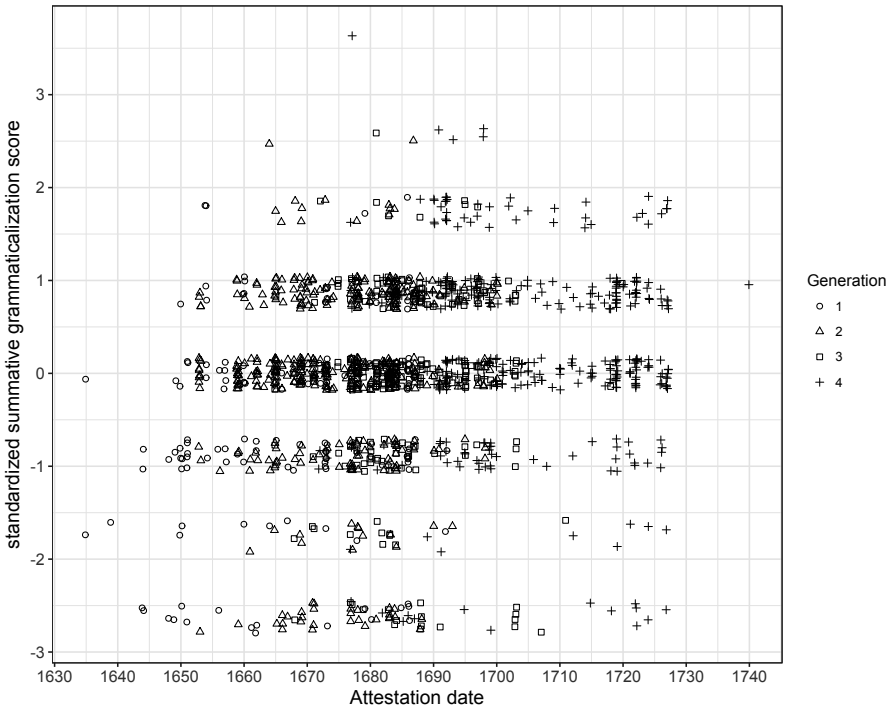


FIGURE 2. Standardized summative grammaticalization scores per data point ($n = 1,369$).

Overall, there is a modest, though highly significant, effect size (Pearson correlation 0.17, $p < 0.0001$) between the date of attestation and the standardized summative grammaticalization score. The relatively small effect size is not surprising. Our data set covers only a single grammaticalization episode, which spans roughly a century, from 1635 to 1727 plus an outlier dated 1740.¹⁰ Grammaticalization of verb-centered constructions (other auxiliaries, copulas, etc.) typically takes considerably longer to fully transpire, suggesting that it goes through several grammaticalization episodes. *Be going to* INF itself continues to grammaticalize after this episode, as seen in, for example, its coalescence into *gonna*, attested in writing around 1800, and its increased functional expansion into an all-purpose future marker into the twentieth century (Krug 2000). Moreover, while we made efforts to control for the authors' social background and register, the actual use of *be going to* INF is presumably heavily influenced by other factors that we do not take into account, such as the topic of the works the data come from, the personal style of the authors, or their regional provenance (see Van de Velde & Petré 2017). And of course, nongrammaticalized instances do not disappear, but continue to happily coexist with grammaticalized ones. This multifactorial reality leads to a decreased signal-to-noise ratio. Indeed, there is considerable variance in our data set, as can be appreciated from the scatterplot in Fig. 2. The Pearson correlation is then, of course, a rather crude measure. To get a more informed idea of the association in our data, we proceeded to a mixed-effects regression model, with random intercepts and random slopes for each individual author (Baayen 2008, Gries 2015, Winter & Wieling

¹⁰ Disregarding the outlier does not perceptibly affect the correlation.

2016).¹¹ The results (given in Table 3) confirm the statistical significance of date of attestation as a predictor for the summative grammaticalization score. Therefore, in spite of the amount of noise, our data set picks up a clear grammaticalization signal.¹²

	ESTIMATE	CONFIDENCE INTERVAL		<i>t</i> -VALUE	<i>p</i> -VALUE
		2.5%	97.5%		
(intercept)	-0.065	-0.206	0.076	-0.906	0.365
DATE OF ATTESTATION (mean-centered)	0.009	0.004	0.015	3.272	< 0.010

TABLE 3. Linear mixed-effects regression model.

6.2. GRAMMATICALIZATION DIAGNOSTICS. We now turn to the question of which syntactic and semantic features coded for play a crucial role. In order to answer this question, we carried out a linear regression with the date of attestation as the outcome variable, and the feature scores as the explanatory variables. In other words: we assessed to what extent the feature scores allow us to predict the date of attestation of a given data point. This flipping of the variables allows us to assess the differential impact of each of the syntactic and semantic scores, by treating them as possible predictors in the model and seeing which are retained in a bidirectional stepwise variable selection procedure. The measure we use for keeping or dropping variables is the Akaike information criterion (AIC) (see Levshina 2015:149–51). This procedure only works with a fixed-effects-only model. The features that are retained are: MOTION, ANIMACY, FRONTING, PREDICTIVENESS, ADJACENCY, and OTHER STRUCTURAL FEATURES, though only the first four are significant at the 0.05 threshold (see Table 4). These six factors are not collinear, as the VARIANCE-INFLATION FACTOR (VIF) scores, which quantify the severity of multicollinearity, are reassuringly low. Other model diagnostics yield the same picture as for the overall mixed-effects linear regression reported above.

In sum, grammaticalization of *be going to* INF seems to be best detected by MOTION, ANIMACY, FRONTING, and PREDICTIVENESS, which eclipse other features. The use of the passive voice has often been considered a crucial feature in the literature (Traugott &

¹¹ One might argue that a linear regression starts from the potentially problematic assumption that the rise should be linear. A matrix-based binomial regression (see Dalgaard 2008:229–37) yields highly similar results, and significance of the predictor is not affected. The fitted curve spanning our data is almost indistinguishable from a linear regression line.

¹² For the use of random slopes, it is recommended to mean-center the numeric predictor (cf. DATE OF ATTESTATION), a procedure that we have followed here. We have not *z*-scored the variable, neither by dividing by the standard deviation nor, as is also advocated, by dividing by two standard deviations (Gelman 2008), as we still want to interpret the slope directly in terms of ‘change per additional year’. With an estimate of 0.009 per year, this translates into an increase of nearly one standard deviation per century. Not surprisingly, the model diagnostics (see Levshina 2015:155–62) leave something to be desired: though there are no signs of heteroscedasticity for the model with the *z*-scored total summative grammaticalization score (studentized Breusch-Pagan test $p > 0.05$), the assumptions of linearity, normal distribution of the residuals (Shapiro-Wilk normality test $p < 0.0001$), and absence of autocorrelation (Durbin-Watson test $p < 0.0001$) seem to be violated to a greater or lesser extent. This means that these models overlook structure in our data. The autocorrelation of the residuals suggests that data points are not fully independent, for instance, but then again, in nonexperimental, real-life settings, data are rarely fully independent (Salsburg 2001:144), and with a fair number of data points, the Durbin-Watson test may be oversensitive. The autocorrelation function (ACF) gives an autocorrelation of the model of 0.07 at Lag 1 only. However, we do not want to make overstretched predictions, especially not since our model is not very good at explaining the variance in our data set (see above for reasons why). The conditional R^2 is 17%. We are concerned here with what our particular set of observations from the authors shows, and do not intend to injudiciously extrapolate our findings to the whole population, however defined. Still, we believe that in comparison with the far more crude measures currently employed in linguistic research on grammaticalization, the linear regression models proposed here offer a deeper insight.

Trousdale 2013:219). Its added value for the model disappears if all features are thrown in. This confirms the hypothesis formulated in §5 that it is the notion of ‘lack of control’ that matters rather than the passive voice itself. It appears that the various semantic parameters combined cover the relevant ground more efficiently than the crude measure ‘passive’. In the discussion section we return to these results and see how they can be further related to the dynamics of innovation and propagation.

$F(6,1362) = 10.67, p < 0.0001$

	ESTIMATE	CONFIDENCE INTERVAL		<i>t</i> -VALUE	<i>p</i> -VALUE
		2.5%	97.5%		
(intercept)	1685.823	1684.877	1686.770	3493.762	< 0.0001
MOTION (standardized)	3.074	2.000	4.149	5.608	< 0.0001
ANIMACY (standardized)	1.197	0.228	2.166	2.423	< 0.0500
FRONTING (standardized)	1.074	0.089	2.059	2.138	< 0.0500
PREDICTIVENESS (standardized)	0.991	0.031	1.952	2.025	< 0.0500
ADJACENCY (standardized)	-0.842	-1.844	0.199	-1.587	0.1130
OTHER STRUCTURAL FEATURES (standardized)	0.737	-0.214	1.687	1.520	0.1290

TABLE 4. Linear regression with date of attestation as outcome variable. Partial effects of all features retained in the stepwise variable selection procedure.

6.3. BELOW THE AGGREGATE LEVEL: GENERATIONS AND INDIVIDUALS. We now turn to the individual speakers in our data set. We do so in two steps. First, we investigate whether there is a difference in the grammaticalization degree of *be going to* INF when taking the generation cohort of the speakers into account. Next, we dig deeper into the individual variation and see how writers differ in the extent to which they grammaticalize.

The results of the cohort analysis are in line with our hypothesis that various aspects or levels of change interact in the overall grammaticalization process. To measure the effect of the generation cohort, we ran the same regression model that was presented in Table 3, but we now added generation as a predictor. We can see that there is a significant jump in grammaticalization scores after generation 1 and after generation 3, using reverse Helmert coding to detect an increase in one generation when compared to the average of previous stages (see Table 5).¹³ In other words: generations 2 and 3 differ significantly from generation 1, and generation 4 differs significantly from the three previous generations. This is true even when controlling for the overall rise in grammaticalization and allowing different intercepts and slopes for each individual author. What this suggests is that, twice, intergenerational changes have taken place next to the more gradual communal change. A log likelihood ratio test was performed to check whether the generation predictor as a whole (instead of the separate factor-level regressors) was significant (see Speelman 2014 for this procedure). As it turns out, the model’s deviance (which gives an indication of the ‘distance’ between the fitted model and the observed data) is significantly increased if the predictor is dropped. In the model in Table 5, the partial slope for the DATE OF ATTESTATION is no longer significant, but the variable is retained in the model to control for communal change.

For the next step in assessing the role of the individual authors in the aggregate grammaticalization of *be going to* INF, we looked at how individual authors changed over the course of their lifetime. The course of change over an author’s lifetime is not a straight-

¹³ Reverse Helmert coding compares each level of a categorical variable to the mean of the previous levels, and it is used in regression analysis to do justice to the ordinal nature of the predictor (Levshina 2015:146).

	ESTIMATE	CONFIDENCE INTERVAL		<i>t</i> -VALUE	<i>p</i> -VALUE
		2.5%	97.5%		
(intercept)	-0.133	-0.271	0.004	-1.899	0.057
GENERATION 2 vs. 1	0.297	-0.073	0.520	2.709	< 0.050
GENERATION 3 vs. 1, 2	0.088	-0.029	0.205	1.534	0.135
GENERATION 4 vs. 1, 2, 3	0.102	0.019	0.205	2.508	< 0.050
DATE OF ATTESTATION (mean-centered)	0.005	-0.001	0.011	1.704	0.089

TABLE 5. Linear mixed-effects regression model, reverse Helmert coding for factor GENERATION.

forward thing to measure. Some start young and continue to publish well into old age. Others have a more brief appearance on the literary scene. Members of the former group, then, have more ‘opportunity’ to change during their lives. In our sample, careers range from under two decades (two authors, sixteen and eighteen years) to over half a century (fifty and fifty-three years).

To overcome this problem, the following procedure was followed: for each individual author, we looked at the SLOPE of the linear regression of the grammaticalization score on the mean-centered date of attestation. A steep positive slope would indicate that the author makes quite a leap in how grammaticalized their use of *be going to* INF is over their lifespan, a flat slope would indicate no change over their lifespan, and a negative slope would indicate a reactionary development. We then use these individual slope coefficients as outcome variables for a regression model with the individual authors’ birthdates as a predictor. This method is not ideal, as it assumes some form of linearity, but it is more sensitive than a blunt binary up-or-down variable, and the method has been applied recently in another study (De Smet & Van de Velde 2017).

A second objection is that slope estimates can be unreliable when we have few data points. To overcome this problem, we look only at authors with more than ten observations spread over more than ten years. A third objection is that authors who start out with high scores of grammaticalization have less opportunity to ‘improve’ (a ‘ceiling effect’). Instead of accounting for this in the calculation of the slope coefficients, we meet this objection by fitting a polynomial for the regression of the slope coefficients on the authors’ birthdates. What this all means in practice is visualized in Figure 3. Here a second-order polynomial is fitted: the tilted parabola curve means that there is an overall increase but the slopes are declining again in the later-born authors, which is probably a ceiling effect. The regression output is given in Table 6. As can be appreciated, the direction of the estimates is as expected, but neither of the two coefficients of the polynomial is significantly different from zero. This means that Fig. 3 should be approached with caution.

Next, we used a similar procedure to see whether there was an association between the individual authors’ birthdates and how often they use the *be going to* INF construction per million word tokens of running text. Authors with less than 500,000 words of sampled text are ignored here. For this measure, we do not expect to see a ceiling effect, as we are not measuring change over the lifespan. This means we do not need a higher-order polynomial here. We see a linear increase over time (Figure 4 and Table 7).¹⁴

¹⁴ One referee wonders whether there is an effect of register. Indeed, some authors in our corpus are engaged in narrative discourse, which may be more concerned with the expression of motion or futurity. To account for this, we reran the analysis with register as a control variable. What we see is that an author’s birthdate remains a significant predictor for the relative frequency of *be going to* INF constructions. Narrative authors (i.e. Behn, Bulteel, Crouch, Crowne, Davenant, Davies, Defoe, Dennis, Dryden, Dunton, D’Urfey, L’Estrange, Phillips, Ravenscroft, and Shadwell) significantly differ from the other authors in using the construction more. We do not pursue the matter of register further here.

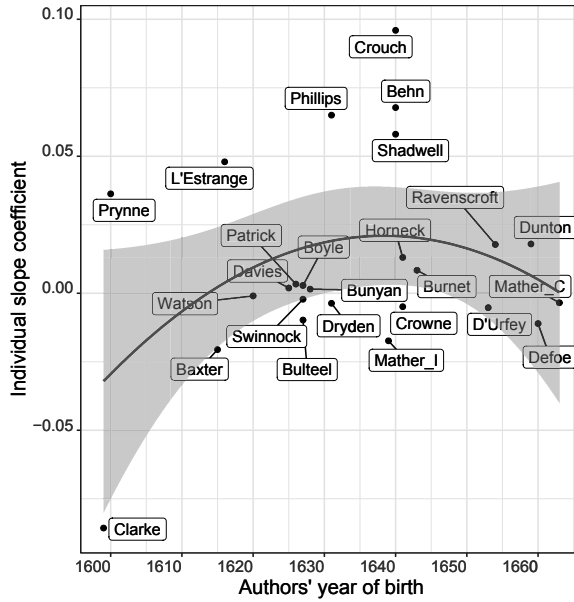


FIGURE 3. (Nonsignificant) change in average grammaticalization score per year for each author.

$F(2,22) = 1.983, p = 0.162$

	ESTIMATE	CONFIDENCE INTERVAL		t-VALUE	p-VALUE
		2.5%	97.5%		
(intercept)	0.011	-0.003	0.025	1.572	0.130
BIRTHDATE	0.035	-0.037	0.107	1.005	0.326
BIRTHDATE, squared	-0.059	-0.132	0.123	-1.720	0.100

TABLE 6. Regression model output: individual slope coefficients by birthdate and birthdate squared.

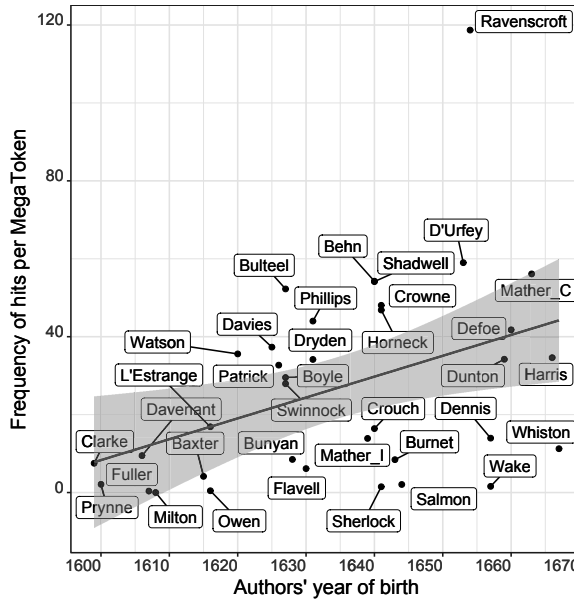


FIGURE 4. Frequency of use of *be going to* INF per million words for each author. Earlier-born authors use it less than later-born authors.

$F(1,34) = 6.74, p < 0.05$

	ESTIMATE	CONFIDENCE INTERVAL		t-VALUE	p-VALUE
		2.5%	97.5%		
(intercept)	-848.267	-1533.350	-163.184	-2.516	< 0.05
BIRTHDATE	0.535	0.116	0.954	2.596	< 0.05

TABLE 7. Regression model output: individual frequency of *be going to* INF by birthdate.

As a third measure of grammaticalization, we have looked at ‘dispersion’, which is a technical term for how equal the distribution of the construction is over an author’s texts. This metric is not often used in corpus linguistics, though several authors have pointed out the added value of dispersion over a pure frequency measure (Gries 2008, Hilpert 2017). There are numerous measures of dispersion (see Gries 2008). We use Gries’s (2008) ‘(normalized) deviation of proportions’ (DP) here.¹⁵ The higher the DP value, the more unequally the hits are distributed in the texts: high values indicate clusters of concentrated use, whereas low values indicate an even spread. Highly grammaticalized elements are expected to have a low DP. Ideally, we should look in the subcorpus of each of the individual authors to check dispersion of *be going to* INF constructions. This is not easy, as we cannot blindly trust the script’s detection of instances. As explained above in §3.2, the number of false positives with automatic extraction is high. We applied a workaround, by looking at the dispersion of each author’s individual data set of nonspurious hits, ordered by date of attestation. Authors who use the construction in a wider time frame and in a more equally distributed way over the years will have a lower DP. As highly grammaticalized elements are typically used in a nonclustered way in language users’ speech, this operationalization of DP might be considered a reasonable proxy of the actual DP. If we apply this metric to our data set and concentrate on authors with more than ten observations, we see that later-born authors have lower DP values (Figure 5, regression output in Table 8).

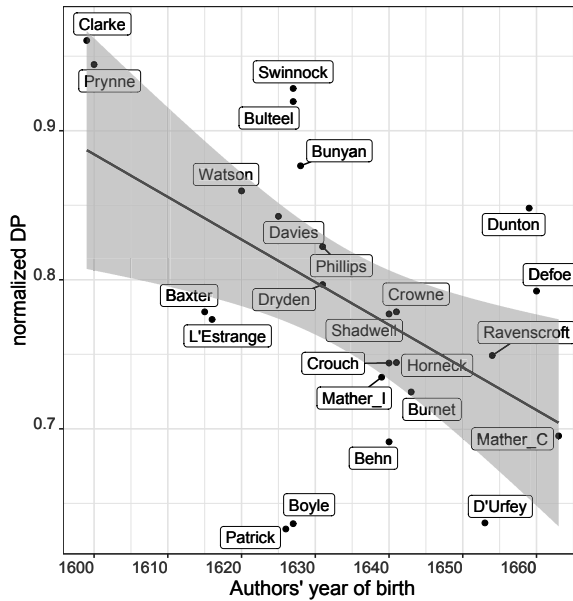


FIGURE 5. Dispersion of *be going to* INF in texts of each author. Later-born authors have more equal dispersion than earlier-born authors.

¹⁵ To calculate this, we made use of Gries’s R script (see Gries 2008).

$F(1,23) = 8.18, p = 0.009$

	ESTIMATE	CONFIDENCE INTERVAL		<i>t</i> -VALUE	<i>p</i> -VALUE
		2.5%	97.5%		
(intercept)	5.460	2.080	8.839	3.342	< 0.01
BIRTHDATE	-0.003	-0.005	-0.001	-2.860	< 0.01

TABLE 8. Regression model output: dispersion of the authors' usage by birthdate.

However, it should be kept in mind that the operationalization of DP as used here is influenced by the time span over which the author writes: long writing careers offer more opportunity for a low DP. There is indeed a correlation between the attestation span of the authors and their DPs, though the correlation is—fortunately—far from perfect (Pearson correlation $-0.51, p < 0.01$). If we add the length of the authors' writing career as a control in the regression model, the effect size of BIRTHDATE remains more or less the same (-0.003 , meaning that the DP goes down 0.3 per century), though not surprisingly, the significance drops with the insertion of the covariate (partial p of BIRTHDATE = 0.077).

7. DISCUSSION. What do these results imply for a theory of grammaticalization? We first discuss the interaction between community and individual members. As it appears, both social embedding and cognitive entrenchment play an important role in this interaction. Second, we zoom in on the extent to which different contexts enable and continue to feed the grammaticalization process. We conclude by pondering what we may have learned about the interplay between the various factors involved in grammaticalization, as set out in §2.

The basis of our data delineation consists of what we have called a GRAMMATICALIZATION EPISODE. The starting point of our specific episode is the fully lexical verb *go* combined with the progressive and a purposive *to*-adjunct. *Go* at this stage always expresses motion, and futurity is inherent only in the purposive adjunct. The endpoint is reached after the combination *be going to* INF has become a construction in which the semantics of future resides holistically, and which has also extended to structural realizations (raising, parentheticals) that are different from those possible in the nongrammaticalized string. The data suggest that this combined shift is completed with generation 4—we elaborate on the evidence for this conclusion below. At this endpoint the construction is still limited to immediate futures (which, according to Traugott 1989, together with futures-in-the-past belong to a single category of 'relative futures'). Remote futures are hardly attested in our data, if at all. The extension to remote futures therefore seems to constitute a second grammaticalization episode (Budts and Petré (2016) observe a significant increase of remote futures toward the end of the eighteenth century). We prefer the neutral term of 'episode', as we do not wish to take a position in the debate on primary versus secondary grammaticalization (see e.g. Smirnova 2015). We do hope, however, that dividing long-term grammaticalization processes into episodes, in which only a limited set of innovative features is relevant, will help determine to what extent different stages of grammaticalization are indeed different phenomena.

Assuming that our data indeed encompass the very first grammaticalization episode of *be going to* INF, we believe our results shed interesting light on the theoretical debate on grammaticalization. Specifically, they allow integration of the relative weights of inherently nonsocial mechanisms such as neanalysis (innovation) and inherently social phenomena such as accommodation to the speech community (propagation). Only Schmid 2015 and Baxter & Croft 2016 try to model this integration, but neither of these studies is based on high-resolution corpus data such as ours. Essentially, what our data suggest is that actual linguistic behavior is a trade-off between entrenched cognitive schemas and

social accommodation. Early authors acquired a grammar in childhood in which *be going to* INF was a compositional string containing a lexical verb *go*. By the time innovative patterns that are no longer compatible with this representation start to spread in the community, their grammatical representations are entrenched to such an extent that they are unable to wholeheartedly adopt all of these patterns. The early authors still accommodate to them, but only to a certain extent. Younger members, by contrast, have acquired the new, grammaticalized analysis early on in their lives. Still, they do not initially produce the full range of instances that is theoretically licensed by the new schema, because their use is constrained by what is conventionalized or at least accepted by the community at large. Only after the great majority of older members, who never neoanalyzed, have left the community are these constraints lifted.

The data confirm this hypothesis in several ways. First, there are two significant leaps in the degree of grammaticalization at the level of the generation cohort. The first leap takes place between generation 1 and generation 2, the second between generations 3 and 4. The first leap may be taken to signal the fact that members from generation 2 neoanalyzed the construction, while those from generation 1 did not. In agreement with existing literature we interpret the loss of motion as evidence of a holistic redistribution of the semantics of futurity across the entire *be going to* INF-string. This is a case of functional neoanalysis but with structural impact: *be going's* sense of 'be about' occurs only with the *to*-infinitive, which therefore ceases to be an optional adjunct. The importance of the loss of motion is confirmed by our regression analysis, where it came out as the strongest predictor, in terms of both effect size and significance. The majority of the utterances from generation 1 are still linked to motion. This can clearly be seen when we compare the proportion of nonmotion uses and motion uses per generation (Table 9). The difference is statistically significant (chi-square $p < 0.0001$, Cramér's $V = 0.29$). Inspection of the Pearson residuals reveals that the association is due to the difference between generation 1 and all the rest.

GENERATION.FACTOR	MOTION	INDETERMINATE/NO MOTION
1	96 (58.9%)	67 (41.1%)
2	117 (23.2%)	387 (76.8%)
3	60 (24.0%)	190 (76.0%)
4	73 (16.2%)	379 (83.8%)

TABLE 9. Proportion of motion uses per generation.

In fact, the five earliest-born individuals of generation 1 entirely lack motionless instances in their repertoire, and the first motionless instances in the four last-born authors appear on average fifteen years after their first publications, while this is only seven years for generation 2.

The second variable that was highly predictive is animacy. Motionless uses with animate subjects still share the feature of control with subjects of lexical *go*. Since control is lost in inanimate subjects, their appearance signals a more categorical semantic rupture with lexical uses. Only the last author from generation 1, Thomas Watson, has inanimate subjects, while more than half of the authors of the following generations (fourteen of twenty-seven) have them.

Recall that the metalinguistic evidence points to 1620–1640 as the period of conventionalization of grammaticalized *be going to* INF. At this time the five earliest-born individuals (born up to 1608), whose output lacks innovative uses, were at least teenagers and possibly past adolescence. The data therefore suggest that their grammar had already become so entrenched that they were no longer likely to neoanalyze and adopt

these innovative uses.¹⁶ Members from generation 2 acquired the new analysis of *be going to* INF at a much younger age, most likely during first language acquisition. They were not constrained by preexisting routines and naturally produced instances with inanimate subjects. Their use was still constrained socially though. An important part of society still consisted of older speakers with more conservative routines. Generation 3 was in a similar situation. As the number of speakers that had acquired the grammaticalized representation gradually grew, their innovative utterances became more and more conventionalized. This process provided continuous opportunities for older active members to realize more innovative utterances themselves, accommodating to the changing situation at the communal level. This interpretation receives some statistical support from the individual slopes of change as charted in Fig. 3. The majority of the individuals remain relatively stable (around 0 on the y-axis).¹⁷ What the tilted parabola curve might reflect, though, is that growth in grammaticalization degree across the lifespan is more likely and more pronounced in authors from generations 2 and 3. This is seen in the slopes of authors such as Phillips, Behn, Shadwell, or Crouch, which appear to stand out. It needs to be pointed out, however, that this increase in grammaticalization is statistically significant at a level of $p < 0.05$ only for Phillips and Behn. Shadwell is close behind with a p -value of 0.059. Crouch's slope, spectacular though it is, does not reach significance. Even with our author corpora of unprecedented size, there are still not enough attestations to establish a statistically robust picture of how individuals change at this earliest of stages.

While any interpretation of Fig. 3 therefore necessarily remains tentative, the results might signal that authors who had grown up with the new analysis realized it more often and in more innovative ways as time proceeded, and earlier-born pregrammaticalizers gradually disappeared from the community, together with their categorical constraints. When generation 4 entered society in the 1670s and 1680s, members from generation 1 had passed into old age, and had become less visible in the community or had passed away. The advanced grammaticalization of generation 4 could imply that it had hit a ceiling from the start, which would explain why these authors do not show any increase in grammaticalization degree across their writing careers. Overall, the evidence is in line with Tagliamonte & D'Arcy 2009, which extends Labov's (2007) incrementation model from morphophonology to morphosyntax. Incrementation is the process by which 'successive cohorts and generations of children advance a change beyond the level of their caretakers and role models' (Labov 2007:346). Based on apparent-time data, Tagliamonte and D'Arcy (2009:99) conclude that intraindividual change is fastest around adolescence, particularly when the change is still in its early stages, but that usage stabilizes after adolescence. At the same time, our results suggest that postadolescence change may still be significant when a generation starts with the new analysis and has a great potential for change, a potential that is realized when social inertia nourished by older generations is gradually lifted.

Another aspect where our study contributes to grammaticalization theory is the concept of switch contexts. We suggested that starting with generation 2, authors had neoanalyzed *be going to* INF in such a way that it could refer to futures regardless of

¹⁶ In fact, based on Fig. 3, Samuel Clarke seems to do the exact opposite, possibly showing reactionary behavior (see also Wagner 2012 for instances from phonology). However, his downward slope is not significant, so it is not very clear what this means.

¹⁷ The statistical power of the regressions for all authors besides Phillips and Behn is lower than 0.5, so we do not have conclusive evidence that stability is indeed the default.

motion. While this suggests that intergenerational change has a significant role to play in a grammaticalization process and that social accommodation gets more limited with age, it emphatically does NOT mean that neoanalysis comes out of the blue. On the contrary, the way to neoanalysis is already paved in generation 1. In almost one third of the instances produced by generation 1 it is impossible to determine whether motion is intended (the ‘indeterminate’ value in Table 2). While the actual proportion of indeterminate instances may well have been lower in spoken language, which is contextually richer, we may still expect that a substantial percentage of instances remain underdetermined. Since nobody has direct access to others’ intended meanings, there is ample opportunity for hearer-based neoanalysis.

The conventionalization of neoanalysis only after 1620 can be related to frequency of conducive contexts and the higher degree of salience that comes with higher frequency. Earlier studies have suggested that the passive provided a critical context and a basis for the neoanalysis of *be going to* INF. Yet the first attestation of the passive, from 1482 (example 6), predates any evidence of conventionalized neoanalysis by more than a century. Apparently, then, the passive was not salient enough to function as a trigger on its own. The situation changes when in the beginning of the seventeenth century a new context emerges that is conducive to neoanalysis, namely that of fronting. In fronted use the idea of motion, even if originally present, is backgrounded, since the focus is on the fronted object, which is part of the intended action expressed by the purposive adjunct. This backgrounding effect is also clearly present in our data. While out of 304 instances that have fronting, ninety-three are not as such incompatible with the idea of motion, only in one case (0.3% of all instances with fronting) is unequivocal motion manifested by means of an explicit and structurally unambiguous goal (against eighty-five of 1,067 or 7.9% of nonfronted cases). Now fronting remained rare until around 1625, the time when neoanalysis occurred (see the discussion in Petré 2019). By that time, however, it had grown in use so as to represent 10% of all uses of *be going to* INF, while passives represented only half that share.¹⁸ Fronted instances may fit into that story. Be that as it may, the important aspect here is that the increased popularity of fronted instances arguably provided a more fruitful switch context than the passive on its own. This is further corroborated by excluding all fronted instances from the regression analysis. Motion ceases to be a significant predictor in this case, suggesting that its loss is inherently connected with the context of fronting. In combination with the already existing passives, fronting provided language users with multiple and sufficient clues to trigger neoanalysis.

The opportunity offered by fronting contexts is further confirmed by the difference in fronting usage between generation 1 and generation 2. Leaving aside indeterminate cases, fronting contexts in generation 1 still refer to motion in 60% of the cases. In generation 2 this has dropped to a mere 10.5% (Fisher exact yields a p -value < 0.01). After generation 2, this rate continues to drop to 3.3% and 1.3% in generations 3 and 4, respectively. Something similar happens with passives. In generation 1, 84% of passives remain tied to motion, while this drops to 28.6% in generation 2 ($p < 0.01$; Gen3: 27.3%; Gen4: 12.8%). In sum, neoanalysis appears to be triggered, not so much by ANY kind of facilitating (switch) context, but only if a (number of) switch context(s) have reached a critical mass. These facilitating contexts are not initially innovative them-

¹⁸ One of the reasons why fronting emerged so much later than passives is probably that it is a phenomenon that predominantly occurs in the present tense. It is only around the end of the sixteenth century that the progressive becomes established in the present tense (cf. Petré 2016b).

selves, but have specific STRUCTURAL properties (fronting, passive), which facilitate innovation through SEMANTIC redistribution (loss of motion).

The impact of facilitating contexts also did not stop once neoanalysis had occurred. Contexts such as fronting and passives initially were largely independent pockets of use. However, speakers may have started interconnecting these various symptoms of grammaticalization, which in turn is assumed to have reinforced the entrenchment of the grammaticalized representation in their minds. Evidence for this assumption is found in the correlation between birthdate and maximum grammaticalization score (higher scores signal a cumulation of features), which appears to be significant (linear regression yields $p < 0.01$).

The final significant predictor is that of predictiveness. It was hypothesized (§3) that, because lexical *go* lacks an independent epistemic layer, its use is restricted to descriptive, egophoric statements, which either are about one's own intentions or are based on direct knowledge of the outside world. Predictive uses under this hypothesis reflect the epistemic function associated with auxiliary use, hence grammaticalized status. A comparison of the proportions of predictive and nonpredictive uses per generation confirms the aggregate trend (chi-square $p < 0.001$, Cramér's $V = 0.17$). Moreover, inspection of Pearson's residuals reveals that the association is mostly due to the difference between generation 4 and the rest. The late appearance of this leap suggests that predictiveness, unlike fronting and passives, did not significantly facilitate neoanalysis. What it may mean is that the social constraints possibly effected by older pregrammaticalizers impacted most on this factor, and that the higher use in generation 4 reflects their disappearance.

To conclude, we return to the issues we believe a comprehensive theory of grammaticalization needs to account for (cf. §2):

- (i) The cognitive mechanisms and motivations underlying the creation of new patterns by the individual;
- (ii) The social-psychological mechanisms and motivations underlying the creation or adoption of new patterns by the individual;
- (iii) The mechanisms underlying propagation at the communal level; and
- (iv) The way (i), (ii), and (iii) interact.

Our high-resolution quantitative-qualitative analysis, while confirming many of the assumptions that are current in usage-based grammaticalization research, arguably has implications for most of these issues. As regards (i), we have provided empirical evidence (late appearance of nonmotion instances in generation 1) that the cognitive ability to neoanalyze a construction is not necessarily limited to first language acquisition, but does suffer in its effect from cognitive aging and entrenchment. Also, neoanalysis appears to be driven by facilitating contexts, but only if these cumulate to reach a critical mass. This second finding also relates to (ii), as it implies that neoanalysis requires sufficient exposure to certain contexts in the speech community. We also found evidence that social accommodation (a major psychological motivation for adoption) works both ways, both conservative (accommodation to earlier-born individuals) and progressive (accommodation to younger community members). Our analysis does not shed any new light on motivations for innovation beyond the fact that the opportunity is there. (A motivation in terms of extravagance—the desire to be noticed (Haspelmath 1999)—has been proposed in Petré 2016a.) The mechanisms at work in (i) and (ii) also interact with the mechanisms that underlie propagation.

Regarding (iii), propagation cannot be seen here as the adoption of one variant over another one, such as *be going to* INF versus *will* INF (the kind of propagation covered by

previous studies, and also the one that typically shows S-curve behavior; cf. Blythe & Croft 2012). At this early stage, *be going to* INF is not necessarily competing with another construction if this means that they together stake out the onomasiological range of expressions for a certain function. All individuals use the construction but with different degrees of grammaticalization. In this context, propagation means propagation of neoanalyzed forms. If interpreted this way, we see that there are signs of communal change, in that everyone adopts newer forms as they come along, but not to the same extent. Propagation also has an intergenerational quality to it, in that pregrammaticalizers exert a conservative influence on the speech community. Once they have disappeared from the community, this is manifested in the loss of constraints on the use of the construction. Interestingly, the complex mixture of entrenchment and accommodation effects seems to result in a three-stage development: (a) pregrammaticalizers who may grammaticalize after first language acquisition, but only to a limited extent (our generation 1); (b) childhood-grammaticalizers who are constrained by pregrammaticalizers (our generations 2 and 3); and (c) childhood-grammaticalizers who are born in a community of grammaticalizers (generation 4).

We have achieved these results to a large extent by implementing a novel methodology of assigning global grammaticalization scores to every attestation in our corpus. To make it possible to compare features that are qualitatively different, we standardized all scores, by subtracting the mean and then dividing by the standard deviation. Feature-specificity need not mean that the method cannot be applied to other case studies. An important assumption we make is that longitudinal grammaticalization processes may be split up into distinct episodes. If taking an episode as a unit, it should be possible to compare results across case studies applying the method we proposed, even if the features fed into the method differ. We hope that the extension of the method to other case studies will make it possible to test the generality of some of our outcomes, such as the three-stage nature of propagation, or the importance of structurally specific facilitating contexts, or lay bare any systematic differences (between first and later grammaticalization episodes, or between grammaticalization centered around verbs and other parts of speech).

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