TESTING CAUSAL ASSOCIATIONS IN LANGUAGE CHANGE: THE REPLACEMENT OF SUBORDINATING *THEN* WITH *WHEN* IN MIDDLE ENGLISH

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ABSTRACT Middle English changes the realization of temporal subordinators from a *th*-form (*then*) to a *wh*-form (*when*). The innovation is quantified with data from four syntactically parsed corpora. The change may have had an antecedent cause in the loss of subject-verb inversion after clause-initial adverb *then*. This view is supported by the time course of the two developments, the loss of subject-verb inversion slightly preceding the rise of *wh*-based subordination, as well as by the fact that the presence of alternative subordinating strategies inhibit the presence of *wh*-subordinators. The paper thus provides quantitative, empirical evidence for language-internally motivated change.

1 INTRODUCTION

This paper is concerned with a change in the formal realization of subordinators in temporal adjunct clauses in the history of medieval English.[1] Old English frequently used the *th*-adverbs *þa* and *þonne* 'then' to introduce temporal adjunct clauses. Two examples from the West-Saxon translation of the Gospels are presented in (1). Here and in the following examples, the temporal subordinate clause has been bracketed, and the subordinator is shown in boldface.

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(1)   a. *ac [þa he wæs þæt ger bisceop] he witgode þæt*
       but then he was that year bishop he prophesied that
       se hæland sceolde sweltan for ðære þeode
       the Savior should die for that people
       'But when he was bishop that year, he prophesied that the
       Savior should die for the people'
       (cowsgosp,Jn [WSCp]:11.51.6768) (c.990)

    b. *[þonne he cymð] he cyð us ealla ðing*
       then he comes he makes-known us al things
       'When he comes, he will explain everything to us'
       (cowsgosp,Jn [WSCp]:11.51.6768) (c.990)

The items *þa* and *þonne* were continued in Middle English, with substantial spelling variation, most commonly as *þo* and *þan*, respectively. From early Middle English times on, these *th*-elements were increasingly replaced by the *wh*-item *when* in this function (e.g., Curme 1931: 268-269, Mitchell 1985: §2775, Declerck 1997: 58-63). Subsequently, there emerged a transitional period with relatively free variation, in which both the conservative and the innovative variant could be encountered. The examples in (2) illustrate this step in the development.

(2)   a. *At þe schere þursday [...] [Þo vre louerd wes isethe.*
       at the Sheer Thursday [...] then our Lord was sat
       to his supere].
       to his supper
       'On Maundy Thursday, [...] when our Lord sat down for the
       Last Supper' (PassionLord,40.91.70) (c.1245)

    b. *at te laste of þi lif [hwen þu for me swa*
       at the last of your life when you for me so
       rewliche hengedes on rode].
       ruefully hanged on rood
       'at the end of your life, when you were hanging for me so
       sorrowfully on the cross' (WooingLord,279.176.113) (c.1230)

    c. *þou hest ueleziþe litel ybore worþssipe. to þe*
       you have many-times little borne worship to the
       bodye of Jesu crist [þanne þou hit yzeȝe].
       body of Jesus Christ then you it saw
       'You have often shown little honor to the body of Jesus Christ
       when you saw it' (CMAYENBI,21.304) (c.1340)

> d. *Sothely,* *þise*   *wordes,* *[**when** I here thaym or redis*
> truly   these words, when I hear them or read
> *þam],* *stonyes* *me*
> them stupefy me
> 'Truly, these words stupefy me when I hear them or read them'
> (CMROLLTR,45.918) (c.1345)

Eventually, the *th*-forms ceased to be productive and *when* remained as the ordinary grammatical option for the introduction of temporal adjunct clauses. This language stage is exemplified by the sentences in (3), which are Middle English renditions of the same Bible passages as the Old English examples in (1).

(3)   a. *but* *[**whanne** he was bischop of that ȝeer], he*
        but when   he was bishop of that year he
        prophesiede, that Jhesu was to die for the folc
        prophesied that Jesus was to die for the folk
        'But when he was bishop that year, he prophesied that the Jesus would die for the people'
        (CMNTEST,11.30J.1143) (c.1383)

        b. *[**whanne** he cometh] he schal telle vs alle thingis*
        when   he comes he shall tell us all things
        'When he comes, he will explain everything to us'
        (CMNTEST,4.20J.294) (c.1383)

The following terminology will be used in this paper. 'Temporal (adjunct/adverbial) clause' refers to the entire finite clause constituent headed by a form of *then* or *when*. The label 'temporal' is intended as a convenient mnemonic for the most common semantics of the investigated structure. It does not imply that only cases of unambiguous time point interpretations were studied since other meanings are available as well, e.g., conditional readings. The term 'adjunct' or 'adverbial' designates the function of the constituent on the sentence level as an optional modifier. It contrasts with temporal clauses as complements in indirect questions (e.g., *I don't know when I'll be back*). Next, I will use the term '(free) relative' to describe the internal structure of the clauses under consideration (e.g., Bresnan & Grimshaw 1978). Two pieces of evidence support the view that temporal adjunct clauses are free relative clauses. First, there are headed relative analogues with temporal antecedents, as in (4). Such structures will be considered here as well.

(4)   a. *on [geres utgange, [**þonne** þu gegaderast þine*
       on year's out-going then   you gather   your
       wæstmas]]
       fruits
       'at the end of the year when you bring in your harvest'
       (cootest,Exod:23.16.3324)

    b. *in [a nyȝt [**whanne** he hadde all i-seide]]*
       in a   night when   he had   all said
       'during a night when he had said everything'
       (CMPOLYCH,VI,429.3131)

Secondly, the temporal clause's temporal variable modifying the main clause event can be bound directly within its local clause or within a clause more deeply embedded inside of it (Haegeman 2010). Ambiguities between local and long-distance extraction of this kind are typical of relative structures (cf. *the man who Mary promised to marry → Mary promised her father to marry* (local) vs. *Mary promised to marry Bill* (long-distance)). The two examples in (5) illustrate such ambiguities between local and long-distance extraction of an initial temporal subordinator in medieval English.

(5)   a. *he of deaðe aras, [**þa** he cydde   [þæt he ær*
       he of death arose then he announced that he ere
       mihte ful eaðe deað forbugan]]
       might full easily death escape
       'he arose from death when he earlier announced that he would very easily escape from death' (cowulf, WHom_6:182.363)
       (i) local (unlikely): he arose at the time that he made the announcement
       (ii) long-distance (probably intended): he arose at the exact time of his announced escape from death

    b. *sum vnseli haueð [**hwenne** ha seide [ha schriue*
       some un-souly has when she said she shrive
       hire]]. ischriuen hire alto wunder.
       her shriven her all-to wonder
       '[Only] a wretched woman has, when she said she shrove herself, [actually] shriven herself wondrously'
       (CMANCRIW-1,II.56.537)
       (i) local (unlikely): she has shriven herself at the time she made the assertion
       (ii) long-distance (probably intended): she has shriven herself at the exact time of her supposed self-confession

My examination excludes generalizing free relatives (e.g., *whenever you are free*, Old/Middle English *when + so*). The initial elements of temporal adjunct clauses will be called '(temporal) subordinators' or 'subordinating *then*/*when*.'[2] Finally, I will use '*th*-item' and '*wh*-item' or the abstract lexemes '*then*' and '*when*' to refer, respectively, to the conservative and innovative variant of the changing variable. They can then be instantiated by a large number of specific spelling variants, such as *þo*, *þan*, *hwen*, *whanne*, etc.

My primary concern in this study is to investigate one particular explanation for the change from subordinating *then* to *when*. This explanation asserts that the loss of distinctive word order patterns after *then* to signal its proper interpretation exerted a causal influence on the rise of the subordinator *when*. Specifically, *then* used to be understood quite reliably as a main clause adverb in the context of verb-second word order, and as a temporal subordinator elsewhere. Declining subject-verb inversion after *then* thus intensified ambiguity between the adverbial and subordinating functions, and could therefore contribute to the recruitment of *when* as a new, designated subordinator. This hypothesis has been hinted at in the specialist literature (Yamakawa 1969, Vennemann 1984, Stockwell & Minkova 1991), but has never been explored in detail. The present study closes this gap by investigating this purportedly causal association with quantitative corpus data.

The paper is structured as follows. Section 2 measures the change from *then* to *when* quantitatively, relying, in particular, on poetic records that have recently been made available in syntactically parsed corpora. Section 3 presents an explicit discussion of the conjecture that a change in word order after *then* was a causal factor in the rise of subordinating *when*, offers a perspective on the change in evolutionary rather than functional terms, and derives two empirically testable predictions from this analysis. Section 4 then continues to test these predictions. Discussion and conclusion follow in Sections 5 and 6.

2 Measuring the rise of *when* as a subordinator

This section describes the measurement of the replacement of *then* with *when* as temporal subordinators in Middle English. I will first outline some simplifying assumptions that are expedient for a comprehensive analysis of the textual data. Subsequently, I will present the corpora used for this

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2 Alternative labels used for the concept of 'subordinator' are 'conjunction' (e.g., Mitchell 1985), 'subordinating conjunction' (e.g., Yamakawa 1969), 'subjunction' (Vennemann 1984), '(hypotactic) connective/connector' (e.g., Lenker 2010) or 'relative (adverb)' (e.g., Declerck 1997).

study and the way the data was collected. The remarks made here will also carry over to the following sections. Finally, I will discuss and summarize the results of this investigation.

2.1 Simplifying assumptions

I will make several idealizations for the diachronic analysis of subordinating *then* and *when* in Middle English. These simplifications will enable a comprehensive statistical analysis of all the material in my database. The resulting methodology is not a claim to best practice, but functions rather as a viable starting point. Future studies might develop superior techniques that can take account of the variables here disregarded.

First, I will discount semantic and pragmatic differences between the two lexemes of the conservative variant, *þa* and *þonne*. The central meaning difference between the two items in Old English has been summarized concisely as follows, "*þonne* as a conjunction [...] is used when the time of an action or occurrence is indefinite and general or it is to be habitually repeated, and is usually found with a [...] verb in the present tense [...]. On the other hand, *þa* as a conjunction [...] is used when the narrator is going to describe a definite action or occurrence confined to a particular point of time, and is most commonly found with a [...] verb in the past tense" (Yamakawa 1969: 11). This distinction between generic and specific readings is quite strong, but not exceptionless. Furthermore, the generalization becomes exceedingly vacuous as one or both of the *th*-subordinators drop out of use in later Middle English. Examples illustrating the typical semantic patterns are shown in (6) below.

(6) a. Generality, present tense – *þan* (< Old English *þonne*)

   and [þan hie fulle beð]. hie secheð to þe fule
   and then they full are they seek to the foul
   floddri.
   mire
   'And when they are full, they desire the foul mire [of drunkenness]'
   (CMTRINIT,37.511)

 b. Specific action, past tense – *þo* (< Old English *þa*)

   *[**tho** I escaped from hym] I loste myn one ere*
   then I escaped from him I lost my one ear
   'When I escaped from him, I lost one of my ears'
   (CMREYNAR,52.309)

Moreover, fine-grained comments on the discursive roles of *þa* and *þonne* have been provided in the literature on historical pragmatics. In particular, *þa* has been analyzed as a device to foreground an action and structure a narrative in various ways (e.g., Foster 1975, Enkvist 1972, Enkvist & Wårvik 1987, Wårvik 2011), while *þonne* has been claimed to mark "backgrounded material" (Brinton 2006: 314). A detailed understanding of semantic differences between *þa* and *þonne* and their interpretations as discourse markers is certainly valuable, but not immediately relevant for the purpose of elucidating the diachronic trajectory of subordinating *then*. I will therefore not code the examples for semantic or pragmatic features in my data set.[3]

Secondly, the two *th*-forms, *þa* and *þonne*, will not be considered separately. Coding for the formal realization of *then* might be relevant to discover potentially different rates of replacement with *when*. For example, Wårvik (1995: 352) suggests that *when* first appeared in clauses expressing a generality in the present tense, i.e., in context typically associated with *þonne*, and only subsequently moved towards definite, past time actions, i.e., into semantic space previously held by *þa*. However, what is relevant for the present investigation is just that both *þa* and *þonne* are eventually replaced by *when*, and in this sense function as one unified variant of the linguistic variable. It is therefore not immediately necessary to code for the formal difference between the two *th*-forms.

Third, *þa*, *þonne* and *when* may show distinct behavior in different dialects. Some texts prefer one of the two *th*-items. *The Northern Rule of St. Benet* (c.1415) uses *þan* as a main clause adverb and both *þan*, albeit rarely, and *when* as a subordinator (my own investigation of the digitized corpus file), as in (7). *The Northern Homily Cycle* (c.1315) unfailingly shows *þan* in the former and *when* in the latter function (Fludernik 1995: 360). A form of *þo* never appears in either text. In contrast, the subordinator *þo* is favored over *when*, and the main clause adverb *þo* over *þan*, in a sample of the *South English Legendary* (c.1260) (Wårvik 1995: 352), as in (8). The word *þo* is used in all functions, with some instances of subordinator *when* in the first 622 lines of *Robert Gloucester's Chronicle* (c.1300) (Yamakawa 1969: 34). These two texts, then, seem to disprefer the lexeme *þan*. The fact that the first group of texts is representative of more Northern and the second group of more Southern Middle English may indicate a dialectal split in the distribution of *þa* vs. *þonne*. A preference of Southern and Southwestern texts of the

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3 The decision to disregard the semantics and pragmatics of subordinators as a variable may lead to some noise in the data. For instance, there may be rare cases of *þo* as a spelling variant of *þei* 'though' (Fludernik 1995: 364). However, inappropriate meanings could only be hypothesized on the basis of detailed, context-specific examinations of individual examples and hence their exclusion would be time-consuming and subjective.

thirteenth century for *þo* over *þan* has also been pointed out by Kivimaa (1966). Similarly, it is possible that the higher incidence of subordinating *when* in the former than the latter texts might point towards its greater frequency in, or spread from, the North.[4]

(7)   Text with preference for *þan* (*Northern Rule of St. Benet*)

      a. *þan* *sall* *þi* *charge* *be* *liht*
         then shall thy charge be light
        'Then your burden will be light'
        (CMBENRUL,4.88)

      b. *þe* *sekenes* *of* *youre* *bodi,* [*þan* *it* *cumis*], *take* *it* *in*
         the sickness of your body then it comes take it in
        gude *entente*
        good intent
        'When sickness of your body comes, take it cheerfully'
        (CMBENRUL,46.1427)

      c. [*when* *sho* *hase* *welle* *done* *hir* *ministracion*], *sho* *may*
         when she has well done her ministration she may
        here *þe* *worde*
        hear the word
        'When she has finished her ministration, she may hear the word [of God]'
        (CMBENRUL,43.1340)

(8)   Text with preference for *þo* (*South English Legendary*)

      a. *þo* *com* *oure* *louerd* *himself* *adoun.*
        then came our Lord himself down
        'Then our Lord himself came down' (CORP145SELT.2658)

      b. [*þo* *caim* *hadde* *is* *broþer* *aslawe*].
        then Cain had his brother slain
        yflemd *he* *was* *þeruore*
        exiled he was therefore
        'When Cain has slain his brother, he was banished'
        (CORP145SELT.13)

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4 If the hypothesis of a dialect split between more Northern *þan* and more Southern *þo* can be maintained, the diachronic development of *þan* to Modern English *then* and extinction of *þo* (or perhaps merging with *though*) would imply a Northern innovation spreading southward, adding to the list of such developments, e.g., the replacement of 3rd person singular present ending *-(e)th* with *-(e)s*.

    c. *[**Wanne** is   felawes sete akneo   [...]]*
       when   his   fellows sat   on-knee [...]
      Akneo   he sat ek
      on-knee he sat eke
      'When his fellows sat on their knees [...], he sat on his knee also'
      (CORP145SELT.48)

While I will keep track of the textual source of every example, I will not code them for dialect. The reasons are the following: (i) The chronological distribution of Middle English texts is uneven with Northern texts attested more sparsely and later than Southern texts. As far as I can see, more Northern vs. more Southern dialect differences are therefore generally difficult to distinguish from random text effects during the relevant time. (ii) Medieval text transmission is complicated by scribal copying, which often leads to language mixing or updating with respect to the original, authorial dialect (e.g., Benskin & Laing 1981). The notion 'dialect' is therefore difficult to operationalize. (iii) It is difficult to deduce in a principled way the ideal number and extent of dialect classes. (iv) Similarly, it is difficult to include the dialect variable in regression models in an interpretable manner (for one promising approach, see Willis (2017)).

Lastly, I will not consider alternative competitors to the expression of temporal subordination in Middle English. For instance, the subordinators *swo*, *so*, *se*, often extended with *al* to *al swo*, *al so*, *also*, or its reduced forms *alse*, *als*, *as*, can frequently be essentially synonymous with subordinating *then* or *when*, as in (9). The potency of these competitors is underlined by the fact that one of its cognates, *als*, has replaced *þa* in the history of German (Yamakawa 1969: 14-15).

(9)   Examples of alternative competitors

    a. *everich saide, [**so** he   gan   ride], /   That Alisaundre*
      every   said   so   they   began ride / that   Alexander
      no   durste heom abyde;
      not dared them abide
      'everybody said, when they were riding, that Alexander would not dare to stop them'
      (Alisaunder,85.1970.[Part_1].[Chap_9].1143)

    b. *[**Also** þe   king slepte] / a sweuen him   imette.*
      al-so   the   king slept   / a dream him met
      'When the king was sleeping, he had a dream'
      (LAYAMON,666.2878)

c. [*As he com prikand out of toun],*
as he came riding out of town,

Com a voice fram heuen adoun,
came a voice from heaven down

'When he rode out of town, a voice came down from heaven'
(AmisAmiloun,58.[Stanza_104].1251.554)

The reasons for the exclusion of these forms are that (i) it is not straight-forward to decide whether such clauses have a temporal or rather some other (e.g., causal) reading and that (ii) my statistical technique would be substantially complicated by the introduction of additional levels of the linguistic dependent variable.

2.2 Data basis

All data for this study was collected from four syntactically parsed corpora of medieval English: the *Penn-Parsed Corpus of Middle English*, second edition (PPCME2) (Kroch & Taylor 2000), the *York-Toronto Corpus of Old English Prose* (YCOE) (Taylor, Warner, Pintzuk & Beths 2003), the *Parsed Corpus of Middle English Poetry* (PCMEP) (Zimmermann 2015), and *A Parsed Linguistic Atlas of Early Middle English*, 1250-1325 (P-LAEME) (Truswell & Gisborne 2015). The data basis comprises a total of 206 text files (42 Old English + 164 Middle English). They include c.1.8 million words of running text in c.140,000 sentence tokens. All examples are cited according to their respective corpus conventions.

I assigned to every text one specific year number indicating a rough estimate of the date when the author may first have written the original. These dates are based on arguments offered in the background literature, in particular in commentaries of modern scholarly editions. It is, however, important to keep in mind that linguistic and temporal discrepancies between a text's archetype and its surviving manuscript witnesses must necessarily result in mere approximation of, and considerable uncertainty in, the true dates of composition. Alternatively, one could code every file for the approximate date of its manuscript source instead. Indeed, some scribes may considerably modernize the language of their exemplar, sometimes to the degree of creating essentially a new redaction of a text. In fact, the very concepts of author and original text may sometimes become murky in the context of medieval manuscript transmission. Despite these important difficulties, I assume that the morpho-syntactic forms *then* and *when* preserved in a manuscript generally represent to a greater extent the language of the
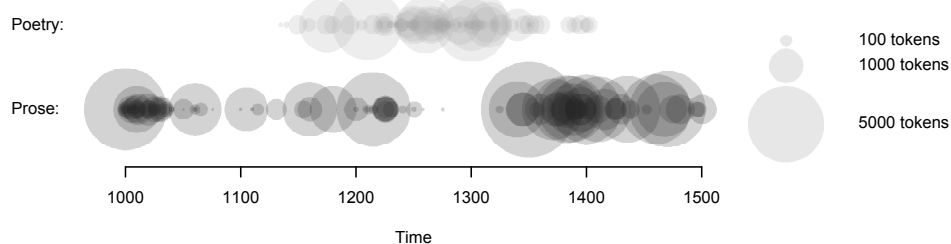
Figure 1   Temporal distribution and size of poetry and prose texts

original than the language of an intrusive scribe, so that estimated dates of composition are preferable over more certain dates of manuscripts (for the same view, see Kohnen 2006: 78).

Middle English shows a substantial gap in the transmission of prose texts in Helsinki period M2, i.e., between c.1250 and 1350. The prose lacuna appears to be even greater than the poor text transmission after the Norman Conquest in 1066. The gap is often used as a convenient way to distinguish between early (c.1100-1350) and late Middle English (c.1350-1500), although the precise division is not standardized. As it happens, the late thirteenth and early fourteenth centuries prose gap corresponds to a period with a great expected amount of variation between subordinating *then* and *when*. It is therefore necessary to complement the data with verse texts as crucial witnesses of English during this era. Relevant poetic texts have recently been made available in the PCMEP and P-LAEME, thus successfully bridging the gap in the prose. All in all, the poetry has about one fifth of the size of the prose in my data set.

Figure 1 illustrates the data basis for this study. Every text is represented by one dot, whose size is relative to the number of sentence tokens the text contains. The X-axis shows the estimated date of composition. The dots on top depict poetic records, the ones on the bottom prose texts. As the graph shows, the verse texts can compensate for the lack of prose texts between c.1250 and 1350.[5]

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5 See Appendix A for name, source corpus, estimated date and genre of every text used in this study.

2.3 Data Collection

All parsed corpus files were queried using the software *CorpusSearch 2* (Randall 2004). The difference between *th-* and *wh-*based subordinators was operationalized in terms of two comprehensive sets of spelling variants saved in a *CorpusSearch* definition file. On account of the substantial spelling variation in medieval English, these lists became quite long. Example (10) shows some strings meant to instantiate *then* and *when*, respectively.

(10) Example strings for the retrieval of *then* and *when*

    a. THEN: +ta|+Ta|+da|+Da|+tonne|+Tonne|+donne|+Donne|
   +Denne|+denne|...

    b. WHEN: w*n*|hw*n|W*n*|w*n*|H*n*|h*n*|Q*n*|q*n|
   uu*n*|$hw*n*|...

The actual syntactic structures were then retrieved as follows. (i) I collected PPs with a P-head and a label for adverbial clauses, CP-ADV*. For the Old English parses, I did not look for the outer PP layer, but for a P-head placed inside CP-ADV*. The terminal of the P-label could then either be a member of the *then* or *when* set of spelling variants. Structures were excluded if the adverbial clause also contained an empty *wh*-element, W*, in order to rule out comparative clauses, whose subordinator *than* is often homographic with temporal *then*. This is the default annotation for finite adjunct clauses in the parsed corpora. (ii) I added free relatives, CP-FRL*, containing an adverbial *wh*-phrase, WADVP*, whose single adverb head, *ADV*, could again be realized as either a member of the *then* or the *when* set. The adverb head was not allowed to include the letter *s* to avoid generalizing free relatives introduced by elements such as *whannse* 'whensoever.' This annotation is a rarer alternative that sometimes occurs for the adjunct clauses under consideration. (iii) I also considered relative clauses introduced by *then* or *when*. The search queries were identical to the ones for free relatives apart from the outer label of the clause, CP-REL*, instead of CP-FRL*. These queries find temporal relatives with nominal (e.g., *at the time when...*) or adverbial antecedents (e.g., *then when...*), both in-situ and in extraposed position. (iv) Finally, I manually browsed through the electronic text files in search for additional examples that had been missed so far. Wherever I found relevant cases, I corrected the syntactic annotation so that they would now be detected by the previous searches (e.g., P-LAEME's token DIGBY86HENDINGT.42 missed an ADV label for *then*, etc.).

However, precision errors were not generally corrected by hand. It might be tempting to resolve problematic examples with difficult or ambiguous

readings by removing or re-coding them. Since manual correction of the data could quite easily become unprincipled and subjective, I decided to accept the corpus annotations instead. This decision is justified because the data comes from human-annotated gold standard corpora, so that the rate of demonstrably inaccurate parses can be assumed to be low, and because it results in a relatively objective and replicable methodology. Nevertheless, it must be mentioned that ambiguous parses or faulty corpus annotation may introduce some noise into the data.

I conducted two queries for the variants of the dependent variable, i.e., one for *then*, the other for *when*, for each of the four parsed corpora. Every retrieved example was coded for its approximate year of composition, its source text, and the genre of its source text (prose vs. poetry).

2.4   Results

I retrieved 776 *then*-clauses in Old English and 908 *then*-clauses in Middle English (hence, 1,684 examples of the conservative variant), as well as 5 *when*-clauses in Old English and 4,664 *when*-clauses in Middle English (thus, 4,669 instances of the innovative variant), resulting in a total of 6,353 examples. Next, I fitted a mixed-effects logistic regression model to the temporal subordination data.[6] It predicts the realization of the subordinator as a *wh*-item from time, controls for genre and includes a random text effect. The resultant model is given in Table 1.

The model estimates an increase in *when*-subordination of 0.034 log-odds per year. At this rate of change, it would take roughly 269 years for the innovative subordinator to rise from 1% to 99% of use. The time variable is highly significant in this model. Hence, it is beyond reasonable doubt that the variation between *then* and *when* subordination is primarily due to a linguistic change. As the genre category is changed from prose to poetry, the log-odds of *when* decrease by -0.493, i.e., poetic documents may be slightly more conservative than prose writings, as the innovative variant seems to be somewhat less likely to appear in the former than the latter text type. The genre variable, however, is not a significant predictor in this model. This finding shows that the change in subordination likely affects poetic and prose texts alike. The poetry records can therefore fruitfully be used to measure the change and fill the gap in prose texts between c. 1250-1350. The subordination data comes from a total of 167 distinct texts. There are 39 text files in the parsed corpora that do not contain any relevant instances of

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6 Here and for the following models, I regressed individual linguistic examples rather than aggregated proportions per text against the explanatory variables.

formula = When ~Year + Genre + (1 | Text), family = binomial, data = When

Fixed Effects

	Estimate	Std. Error	z-value	*p*	
Intercept	-41.458	4.575	-9.062	<0.001	***
Year	0.03417	0.002413	13.704	<0.001	***
Genre (Prose >Poetry)	-0.493	0.427	-1.152	0.249	

Random Effect

Texts	N=167
Variance of random intercepts	3.476

Null deviance	7346 on 6352 degrees of freedom
Residual deviance	2074 on 6349 degrees of freedom
AIC	2082

Table 1   Mixed-effects logistic regression model for the rise of *when* as a subordinator

then or *when*. The random variability among these texts is very substantial as shown by a large variance parameter of 3.5. This is due, in part, to a number of large outlier texts at the beginning and end of the change, but may also suggest measurement error or important effects of uncontrolled factors, such as an author's social class or dialect, a text's register, intended audience, faulty modern editions, incorrect dating, or the degree to which a manuscript witness of a text exhibits language mixture due to copying, updating or translation effects.[7]

The model performs well, especially given that it represents a change from medieval times, where the quality of the data is generally quite low. It

7 The severity of potentially problematic effects of manuscript copying could be established by comparing earlier and later manuscript witnesses of the same text. Some rudimentary studies of this type have been conducted: "In the first 8020 lines of *Laȝamon*, [...] I have found ten instances [...] where *Þenne* in the [earlier] Caligula MS. corresponds to *wanne* in the [later] Otho MS. As to *The Owl and the Nightingale*, there are eight instances [...] where *þane* [...] in the earlier Cotto MS. [...] corresponds to *hwanne* [...] in the [later] Jesus MS. [...] with an exceptional single instance [...] where *hwanne* in the Cotton MS. corresponds to *þanne* in the Jesus MS." (Yamakawa 1969: 32). Hence, later manuscripts do indeed modernize the form of temporal subordinators to some degree, thus introducing error into the data. Overall, however, these two texts correspond in *then* and *when* forms across their manuscript witnesses in most cases. It thus remains preferable to operationalize the time variable as date of composition rather than as date of manuscript creation, as argued in Section 2.2.
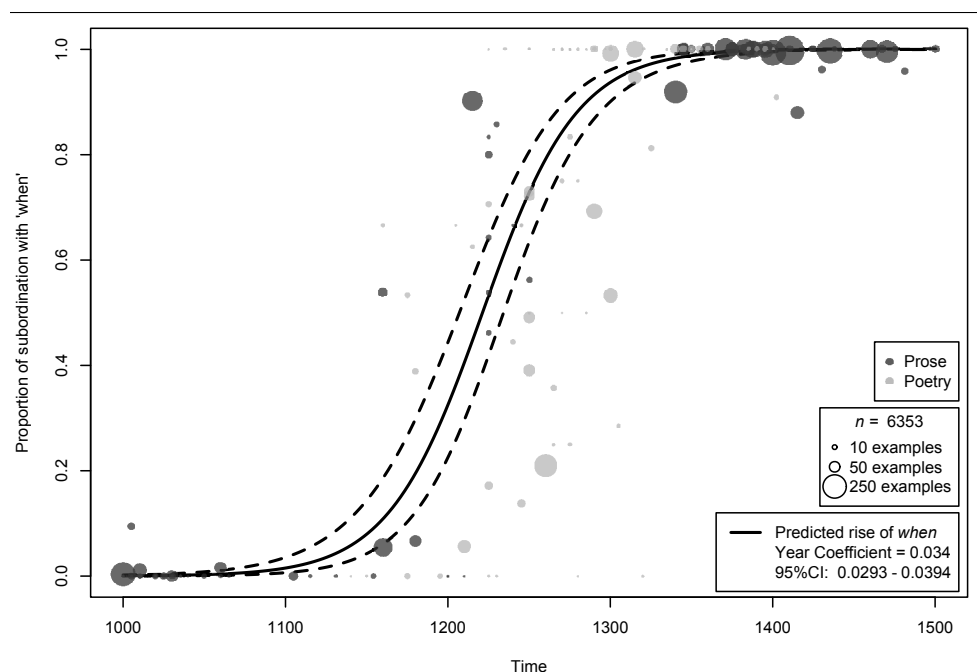
Figure 2 The rise of the Middle English subordinator *when*

fits significantly better than a null model (where the null model is an intercept only model) (Likelihood Ratio Test, $\chi^2 = 5506$, df=3, p<0.001***). It fits the data adequately overall (Pseudo-$R^2_{marginal}$= 0.755, Pseudo-$R^2_{conditional}$=0.881, Hosmer-Lemeshow test $\chi^2 = 3.1952$, df = 8, p = 0.9215). The model has substantial classificatory power (C-index= 0.983, classification accuracy =93.7% vs. baseline: 73.5%).

The graph in Figure 2 illustrates the change from *then* to *when*. Every text is represented by one data point. Prose documents are shown in dark grey, verse texts in light grey. The size of every data point is proportional to the number of examples contained in its respective text. The figure also includes a regression line for the rise of *when* as a subordinator as well as its 95%-confidence interval from a mixed-effects logistic regression model (Table 1) but with the insignificant genre effect removed.

As Figure 2 shows, the subordinator *when* is extremely rare before c. 1125. Temporal subordinate clauses are usually introduced by *þa, þonne* 'then' in Old English instead. In fact, I found only five relevant instances

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of *when* from this period, three adjunct clauses and two relative clauses modifying temporal antecedents. Moreover, the adjunct clauses conform to the tendency of Old English *hwænne* to be syntactically independent of its head, as is typical for adjuncts, but semantically interpretable as the content of its head, as is typical for complements (Mitchell 1965, 1985: §2055, §2776). Such examples may instantiate pathways, or intermediate stages, between *when*'s modern status as a subordinator in temporal adjunct clauses and its interrogative origin in indirect question complement clauses. The peculiar semantic ambiguity of such structures means that "the claim that *hwonne* was already in Old English a *purely* [italics mine] temporal conjunction cannot be sustained" (Mitchell 1985: 159). It is therefore debatable whether all the retrieved instances of Old English *when* are indeed comparable to later instances of subordinating *when* and should actually be included in the data set.[8] In (11), I give two examples of such adjunct clauses, and one example of a headed relative clause.

(11)   a. *minre sawle þyrste*   *to þan lyfigende Gode,*
           my   soul   thirst.subjunctive   to the living   God
           [hwænne ic cume & me æteowige beforen Godes
           when   I   come   and   REFL   appear   before   God's
           ansene]
           sight
           (coalcuin,Alc_[Warn_35]:292.213)
           (i) temporal reading: 'May my soul be thirsty for the living God, [at the time] when I come and appear before the face of God'
           (ii) content reading: 'May my soul be thirsty for the living God, [may it be thirsty for the time] when I come and appear before the face of God'

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8 It is in fact possible that one should not compare instances of early, Old English *when*-clauses with the property of expressing the content, rather than temporal modification, of a head to instances of later, Middle English *when*-clauses without this characteristic. This is one example of a problematic structure that could be resolved by re-coding or removal. However, following the methodological consideration laid out in Section 2.3., I will not correct these potential precision errors but instead accept the corpus annotations as an objective and replicable standard for inclusion.

b. *[...] þæt he   wyle abidan, [**hwænne** he   hire   eað*
[...] that they will abide   when   they theirs easily
gewrecan muge]
avenge   might
(coalcuin,Alc_[Warn_35]:215.154)
(i) temporal reading: 'so that they will wait [instead] when they
might easily avenge their [sense of injury]'
(ii) content reading: 'so that they will wait [for an opportune
moment] when they might easily avenge their [sense of injury]'

c. *Gesete me   andagan, [**hwænne** ðu   wille þæt ic for þe*
set   me time   when   you want that I   for you
gebidde]
pray
'Set me a time when you want me to pray for you.'
(cootest,Exod:8.9.2629)

Figure 2 also demonstrates that the verse texts can successfully be employed for the purpose of this study. The light grey poetry dots largely originate from the time of the prose gap in Helsinki period M2, c. 1250-1350, are fairly numerous, and exhibit, as expected, substantial variation between *then* and *when*-based subordination. By extension, the authors of these texts may have represented two competing syntactic options for the production of the respective structures in their mental grammar. The sentence pairs in (12) – (16) below illustrate the presence of both the conservative and the innovative form within the same poetic documents.

(12) *The Rhymed Pater Noster* (Lambeth Homily no. [6]), c. 1160

a. *we nabben   wil   to sunegen.*
we not-have will to sin
*[**þenne** ure   unwines us   munegen]*
then   our enemies us   tempt
'We have no will to sin when our enemies tempt us'
(PatNost,72.63.144)

b. *to gode solf we us   wreið;*
to God self we us   accuse
*[**hwenne** we þos   word   seggeð]*
when   we these words say
'We denounce ourselves to God himself when we say these
words' (PatNost,93.65.182)

(13) *The Bestiary*, c. 1225

    a. *we ben siker dere,   So ðis wirm in winter is,*
       we are safe there, as this worm in winter is,
       [ðan ge ne tileð nummore]
       then you not till nomore
       'We will be safe there, just as this insect is in winter, when you do not till anymore' (Bestiary,143.9.290.[Ant_Significance])

    b. *[wanne he is ikindled] Stille lið ðe leun,*
       when he is whelped still lies the lion
       'When he is first born, the lion lies quietly' (Bestiary,9.1.17.[Lion_Nature])

(14) *The Owl and the Nightingale*, c. 1250

    a. *þan gode ich fulste to longinge,*
       the good I help in longing
       vor [þan him longeþ] ich him singe:
       for then him longs I him sing
       'I help the good man in longing, for when he feels desire, I sing to him' (OwlNight,76.890.503)

    b. *an prostes upe londe singeþ*
       and priests upon land sing
       [wane þe liȝt of daie springeþ]
       when the light of day springs
       'Country priests sing when the light of day springs up' (OwlNight,62.734.423)

(15) *Havelok the Dane*, c. 1290

    a. *[þan he was ded], þere micte men se*
       then he was dead, there might one see
       þe meste sorwe that micte be
       the most sorrow that might be
       'When he was dead, one could see the greatest sorrow that could ever be' (Havelok,8.233.107)

b. [***Hwan*** *he* *wore* *come,] sket* *was* *þe* *erl* *yare,*
when   he   was   come   quickly   was   the   earl   ready
Ageynes *denshe* *men* *to* *fare,*
against   Danish   men   to   go
'When he had arrived, the earl was ready right away to advance against the Danish' (Havelok,73.2575.1188)

(16) *Amis and Amiloun*, c. 1315

a. [***Þo*** *þai* *were* *fiften* *winter* *old],*
then   they   were   fifteen   winters   old
He *dubbed* *boþe* *þo* *bernes* *bold*
He   dubbed   both   the   children   bold
To *kniȝtes* *in* *þat* *tide,*
to   knights   in   that   time
'When they were 15 years old, then he bestowed a knighthood on the two bold boys' (AmisAmiloun,10.[Stanza_14].165.55)

b. [***When*** *þey* *were* *tvelue* *winter* *old],*
when   they   were   twelve   winters   old
In *al* *þe* *londe* *was* *þer* *non* *hold*
in   all   the   lond   was   there   none   held
So *faire* *of* *boon* *no* *blode.*
so   fair   of   boon   nor   blood
'When they were 12 years old, nobody in all the land was considered as fair of boon and blood' (AmisAmiloun,5.[Stanza_5].60.19)

Finally, Figure 2 reveals that documents written after c. 1375 almost universally form temporal clauses with *when*. Isolated examples of conservative *then* persist until the late Middle English period in the fifteenth century (e.g., Fulk 2012: 110, Fludernik 1995: 366). The examples in (17) illustrate such rare cases.

(17) Late instances of conservative *then*

a. *þe contre was ȝeuen longe bifore to Horn, þrouȝVortyger, [þo he hade spousede his cosyn];*
'Horn had been given the country much earlier by Vortigern, when he had married his cousin'
(CMBRUT3,53.1563) (c. 1400)

b. [***Than*** *þis creatur & hir felawshep was come to Constawns], sche herd tellyn of an Englysch frer,*
   'When this creature and her followers had come to Constance, she heard people speak about an English friar.'
   (CMKEMPE,63.1405) (c. 1435)

c. [***Than*** *sir Brastias saw his felow yfared so withal], he smote the duke with a spere,*
   'When Sir Brastias saw his fellow treated in this way, he smote the duke with a spear.'
   (CMMALORY,21.642) (c. 1470)

2.5 Summary

This section presented a measurement of the Middle English change in the realization of temporal subordinators from *then* to *when*. The development was found to be relatively straightforward. The two variants are, by and large, identifiable by form, and can therefore easily be retrieved from parsed corpora. There is sufficient textual material to study the innovation from its earliest beginnings to its complete penetration in the population. Poetic texts predominate during the critical period when variability between *when* and *then* is at its highest. The change is likely reflected as reliably in poetry as in prose. Texts before c. 1125 almost categorically use a form of *then* while texts written after c. 1375 predominantly use *when*, with virtually all free variation occurring within the narrow transitional period in between.

3 Explaining the emergence of *when* as a subordinator

I will now present a possible explanation for the emergence of *wh*-based temporal subordinators. The change will be conceptualized in broadly evolutionary terms. The explanation allows the derivation of two empirically testable hypotheses.

3.1 The rise of when as a consequence of the loss of disambiguating word order

The Old English items *þa, þonne* can be interpreted as a main clause adverb 'then' or as a temporal subordinator 'when.' They are therefore sometimes labeled "ambiguous adverb/conjunction" (e.g., Mitchell 1984, 1985: §2536, Blockley 2001: 121-152, Lenker 2010: 64-66). The two readings correlate strongly with distinct word orders. I conjecture that the loss of these disambiguating word order patterns facilitated the change in the formal expression of temporal subordination.

Old English *þa*, *þonne* 'then' as a main clause adverb overwhelmingly attracts the finite verb, leading to verb-second patterns, both with pronominal and nominal subjects (as in (18)).[9] This tendency is usually characterized as robust. Thus subject-verb inversion after *then* functions as a strong contextual cue for its interpretation as a main clause adverb during that time (e.g., Smith 1893: 222, Dahlstedt 1901: 80, Mitchell 1984, 1985: §§2539-2553, Kemenade 1987: 111, Pintzuk 1999: 93).

(18)   a. *then* + subject-verb inversion with pronominal subject

   þa   aras   he
   then   arose   he
   'Then, he arose' # 'when he arose'
   (cowsgosp,Mk_[WSCp]:2.14.2301)

   b. *then* + subject-verb inversion with nominal subject

   þa   aras   se   lichoma
   then   arose   the   body
   'Then, the body arose' # 'when the body arose'
   (comart3,Mart_5_[Kotzor]:Oc18,C.6.1964)

Conversely, Old English *þa*, *þonne* 'when' as a subordinator co-occurs quite systematically without subject-verb inversion. Rather, it is followed by a form of subject-verb order. The subject and finite verb may be separated by heavy material so that the finite verb appears in clause-final position, as in (19a). This alignment may have been more common or even systematic at some earlier stage of the language as suggested by the fact that verb-final patterns are in the process of declining from a higher frequency in Old and early Middle English (e.g., Pintzuk 1999, Trips 2002). Alternatively, subject and finite verb may be essentially adjacent[10] to each other so that the finite

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9 The distinction between inversion with pronominal and nominal subjects has been important for theoretical reasons in the study of Old English to diagnose "true" inversion ("V-to-C movement").

10 Light adverbs, (i), and pronouns, (ii), may intervene between subject and finite verb (e.g., Pintzuk 1993, 1996, Haeberli & Ihsane 2016).

   i *þa   God   **ærest** gesceop   gesceafta   þurh   his   mihte*
     then   God   erst   created   creatures   through   his   might
     '[...] when God first created creatures through his might'
     (coaelhom,ÆHom_13:98.1929)

   ii *þa   seo   burhwaru   **him**   com   to*
      then   the   burgher   him   came   to
      '[...] when the citizen came to him [...]'
      (coaelhom,ÆHom_5:92.743)

verb is placed in its canonical, verb-medial position, as in (19b). This word order has become quite common by the time of recorded Old English (e.g., Stockwell & Minkova 1991: 375, Pintzuk 1999). These word order regularities are also quite robust. Hence, subject-verb orders after *then*, whether separated or adjacent, reliably indicate its reading as a temporal subordinator in Old English (e.g., Andrew 1940: 177, Mitchell 1985: §§2544-2546, Stockwell & Minkova 1991: 380, Blockley 2001: 127).

(19)   a. *then* + no subject-verb inversion, specifically verb-final, SXV

   ac   sume   dæge on   ærnemergen   [þa   he   of   slæpe
   but   some   day   on   early-morning then he   of   sleep
   awoc]   he   abræc   into   ðam   bure
   awoke   he   broke   into   the   bower
   'But some day, in the morning, when he awoke from sleep, he broke into her bedchamber' # 'then he awoke'
   (coapollo,ApT:1.10.9)

   b. *then* + no subject-verb inversion, specifically verb-medial, SV(X)

   [...] gelice þam   þe   Iudeas didon [þa   hi   mængdon
   [...] like   to-that that Jews   did   then they   mixed
   eced   and   geallan togædere]
   vinegar and   gall   together
   ' [...] similar to what the Jews did when they mixed vinegar and bile together' # 'then they mixed'
   (cocanedgD,WCan_1.1.1_[Fowler]:39.48)

The interpretation of Old English *then* can thus be conceptualized as dependent on a syntactic condition: the item tends to receive an adverbial reading before a verb in second position, and a subordinator reading elsewhere, i.e., in subject-verb clauses. An idealized summary of these conditioning factors is shown in (20) below, where forward slashes mean 'in the context of.'

(20)

   THEN ⟨ main clause adverb   / _verb-second
            subordinate clause subordinator / ~ (elsewhere, subject…verb)

There are exceptions to the correlation between verb placement after *then* and its interpretation as an adverb or subordinator. First, Mitchell (1985) suggests that there may be Old English examples of main clause adverbial *then* without verb-second order:

> "I find it hard to believe that, whenever we have in the prose a clause with *þa/þonne* S(...)V which must be a principal clause, there must be a scribal error. [...] ÆCHom i. 144 14 *þa Maria, þæt halige mæden, and þæs childes fostorfæder, Ioseph, wæron ofwundrode þæra worda*" (Mitchell 1984: §2550).

Inversely, Andrew (1934, 1940) (see also Campbell 1970: 95) argues forcefully that subordinating *then* is compatible with verb-second orders. Andrew investigates passages

> "from works which are translations from the Latin: [...] *Oros. 156.29. Ða ascedan hiene his þegnas* [...] [T]he Latin begins with a temporal clause 'cum a sociis increperatur' [...], and again there can be little doubt that we should render 'when his thanes asked him' [...]. Such passages establish quite clearly the 'þa com he' type of subordinate clause as a genuine O.E. idiom" (Andrew 1934: 179).

However, the overwhelming majority of unambiguous instances of adverbial *then* does in fact form verb-second patterns, and most instances of unambiguous subordinating *then* do in fact occur with a form of subject-verb word order. Mitchell summarizes that "[w]ith *þa* and *þonne* [...] the pattern Conj. S(...)V [subordinator], adv. VS [main clause adverb] is well established" (1985: §2543, see also the expressions "useful guide" and "rule of thumb" in §3922, and Traugott 1992: 277). It thus remains legitimate to maintain the assumed relation between word order and interpretation, at least as a solid tendency.

The syntactic condition just described weakens over time from the Old English period on. Specifically, main clause adverb *then* loses its special ability to attract the finite verb. The robust correlation between verb-second order and *then*'s interpretation as a main clause adverb thus becomes a merely probabilistic constraint. Main clause adverb *then* becomes compatible with other, subject-verb alignments, at first, rarely, later sometimes, eventually most of the time.

As a consequence, the syntactic conditions no longer consistently distinguish between the two functions of *then*. Rather, the decline in subject-verb inversion after *then* greatly amplifies its ambiguity. Middle English speakers,

as modern readers of Middle English texts, now have to rely exclusively on the linguistic context to decide which grammatical role is intended. Example (21) illustrates a case of clause-initial *then* followed by subject-verb order that seems to be interpretable to the same degree of plausibility as an adverb or as a subordinator.

(21) *Tho   the   screwe   was   overcome;   Sori   he   was   and   wo.*
     then   the   villain   was   overcome   sorry   he   was   and   woe

(i) 'Then the villain was overcome. He was sorry and miserable.' (main clause adverb)
(ii) 'When the villain was overcome, he was sorry and miserable.' (subordinator)
(Frideswide,43.55) (c. 1300)

The intensification of this kind of ambiguity could then plausibly have been a causal factor in the emergence of *when* as a designated subordinator.

This hypothesis has been hinted at implicitly several times in the literature. Yamakawa sees "one of the motive factors that might have induced *then* to be replaced by *when* [in] the fact that the latter was semantically more distinct as a subordinate conjunction than the former" (1969: 28). Hence, he postulates an advantage in the presence of an unambiguous, specialized subordinator[11] over the ambiguous adverb/subordinator forms *þa, þonne*, but makes no explicit reference to changing word order patterns. Vennemann claims that "[g]eneralized subject-verb syntax [...] requires a category of subjunctions [e.g., *when*]" or "presupposes the development of a separate category of subjunctions" and that "[o]nce a category of subjunctions had been established, the analogical remodeling of [the word order of] subordinate clauses after main clauses was innocuous" (1984: 633-634). He thus suggests a link between word order developments (specifically the loss of verb-finality) and the rise of explicit subordinators. However, he orders the chronology of the two changes incorrectly – clearly subordinate subject-verb syntax arises long before *wh*-based subordination. The latter development thus cannot be a necessary condition for the former. Finally, Stockwell & Minkova (1991), who build on Vennemann but argue for an analogical spread of subject-verb order from subordinate to main clauses, come tantalizingly close to proposing a hypothesis similar to the one entertained here (Section 3 "the rise of explicit conjunctions"). In particular, they state that "[o]nce

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11 There is no notable ambiguity between subordinating *when* and interrogative *when*. Firstly, context can virtually always disam biguate between the two uses. Secondly, direct *wh*-questions are systematically followed by subject-verb inversion throughout the history of all Germanic languages with no signs of diachronic weakening (e.g., Fuß 2003).

verb-second was lost, the 'monster' of ambiguity could arise" (Stockwell & Minkova 1991: 383). Yet they leave implicit the inference that the loss of subject-verb inversion after *then* might thus have led to the appearance of subordinating *when*. Instead, they "put aside from the remainder of [their] discussion the motivation of the replacement of *th*-words (i.e., deictics) by *wh*-words (i.e., indefinites)" (Stockwell & Minkova 1991: 384).

This paper is thus the first to put forward explicitly the hypothesis of a causal influence of the loss of subject-verb inversion after main clause adverb *then* on the rise of subordinating *when*. This is the main question to be examined in this paper.

3.2   *Conceptualizing causality in language change*

How exactly should one conceive of the rationale for the proposed causal link between the loss of disambiguating word order patterns and the emergence of the unambiguous subordinator *when*? Here, and for linguistic changes in general, I propose an evolutionary, rather than functional,[12] conceptualization. Evolutionary explanations of language change invoke differential degrees to which competing linguistic forms are adapted to a grammar system and ancillary systems in the explanans. If a form has a greater fitness or advantage than a competitor relative to the linguistic environment in which it is used, then its probability of use will increase and hence, all things being equal, its actual use will increase over time. The locus of selection is probably children acquiring language but may also be adolescents or adult speakers (see e.g., Lightfoot 1999: Ch. 4, Newport 1990, Tagliamonte & D'Arcy 2009, Raumolin-Brunberg 2005 for but a few of the large number of publications on the relation between age and language change). There is currently no full understanding of the exact mechanism of selection of an advantageous form and its psychological entrenchment (see, e.g., Yang (2002) for an explanation

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12 The term 'functional' is used in a number of different senses in linguistics. In my understanding, the central tenet of functional explanations of language change is purposiveness in the explanans. In other words, functional explanations are teleological explanations (e.g., Lass 1997: Ch. 7). For example, functional concepts such as a tendency to maintain distinctive categories, repair strategies, a principle of contrast or chain shifts all presuppose a goal. In the present case, a functional explanation could assert that speakers recruited *when* as a temporal subordinator in order to preserve the contrast between adverb-initial main and temporal subordinate clauses. Evolutionary and functional descriptions of grammatical innovations are merely different perspectives on the same empirical phenomenon. However, I submit that evolutionary formulations should be preferred over functional ones because the former have at least the potential to produce scientifically testable predictions based on a single principle of selection that accounts for the illusion of purposiveness, whereas the latter invoke teleological thinking in the form of several, disjoint principles that reify this illusion.

in terms of least ambiguous parsing, or Jäger (2008) for an explanation in terms of communication optimization formalized in game theory).

For the case at hand, one could reason as follows. The innovative form *when* should be analyzed as a subordinator without exception whenever it is activated in the mind. The conservative form *then*, on the other hand, would not be unambiguously recognized as a subordinator whenever it is used. Further, its degree of ambiguity would increase as verb-second after *then* becomes rarer. The innovative variant would thus be processed more frequently, at least in parsing but possibly also in production, and therefore become more entrenched in the mind as time goes by.

One corollary of such an evolutionary conception of language change is that the historical development of a linguistic form must be understood as contingent rather than deterministic in nature.[13] The reason is that an

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13 A non-deterministic effect of the loss of disambiguating word order on the emergence of subordinating *when* is also suggested by the fact that German and Dutch have innovated new subordinators in some contexts while simultaneously retaining their verb-second syntax.

Modern German now uses the subordinator *als* 'when' for its earlier cognate of Old English *þa* (*da*, *to*, *do*, *duo* etc.) (e.g., Hartweg & Wegera 1989: 139, Axel-Tober 2012: Ch. 5). The form *da* has instead become a causal subordinator. However, the word can still be encountered with a temporal interpretation in archaic registers (Dudenredaktion 2015: 387). In such contexts, its interpretation remains conditioned on word order, *da kam Gott* 'then, God came' vs. *da Gott kam* 'when God came' (e.g., Bloomfield 1914: 194). The subordinator *wenn* (closely related to, but formally distinct from, interrogative *wann*) 'when' has replaced German's earlier cognate of Old English *þonne* (*danne*, *tanne*, *danne* etc.) (e.g., Rutten 2012, Senyuk 2014: 152).

Modern Dutch continues to uses the form *toen* (earlier *thuo*, *doe*, *doen*), which is directly related to Old English *þa*. The additon of *n* is a secondary development (e.g., Instituut voor de Nederlandse Taal 2018). Some c. 17th century Dutch dialects distinguished between *toen* 'then' and *doen* 'when' (Burridge 1984: 152). However, Standard Modern Dutch behaves like Old English in that it regulates the interpretation of *toen* by word order, *toen kwam ze* 'then she came' vs. *toen ze kwam* 'when she came' (e.g., Evers-Vermeul & Sanders 2009: 846). The Dutch subordinator cognate with Old English *þonne* (*than*, *dan*) seems to have taken on adversative meaning 'except, but' relatively early so that its original, presumably temporal meaning is badly attested (e.g., Rutten 2012). At any rate, Dutch has innovated new items, *als* and *wanneer* ('when' + 'ere') for the relevant temporal subordinating function (e.g., Hachem 2015: 168-169).

On the one hand, the recruitment of the *wh*-forms German *wenn* or Dutch *wanneer* echo the English development, which suggests that the mere ambiguity of *th*-items between adverb and subordinator constitutes an unstable state easily open to replacement. On the other hand, the fact that German and Dutch supplanted the *th*-forms only partially whereas English witnessed the wholesale substitution of all of its *th*-subordinators may support the idea that the word order changes unique to the history of English did indeed play a role. More detailed studies are required to identify the specific complexities that led to the cross-linguistic similarities and differences. Furthermore, the exact timing of the Dutch and German changes should be established and compared to English. Only then will it be possible to evaluate to what degree comparative evidence is compatible with the hypothesis of a causal influence of

advantage of a linguistic form is assessed relative to a crisscrossing network of interrelated and mutually influencing grammatical, cognitive, sociological and historical conditions. These interwoven factors are so complex as to make the formulation of a highly regular, predictable law of change virtually impossible. For example, the deterministic prediction 'if a language loses verbal inflections, it will also lose V-to-T movement' (e.g., Koeneman & Zeijlstra 2014) misses the point that the advantage of one grammatical option over another cannot be assessed independently of the specific linguistic and extra-linguistic environment in which it is used. For the case discussed here, the greater unambiguity of subordinating *when* over subordinating *then* may bestow an advantage on subordinating *when* and hence lead to an increased probability of its use, but this condition alone is neither sufficient nor necessary to trigger the change deterministically in all conceivable situations. Rather, the particulars of the Middle English cultural and linguistic systems could have caused the survival of the conservative competitor *then*, the rise of an innovative form other than *when*, the emergence of a different way of marking subordination altogether, or the extinction of the category of temporal subordinate clauses, etc.

I will now mention but a few of the possible conspiring factors that may have been relevant in the appearance of the temporal subordinator *when*. First, literary English society during the High and Late Middle Ages was multilingual. As a consequence, Middle English shows extensive influences, in particular, from Norman French.[14] It does not seem unreasonable that the multilingual situation in medieval England would also have contributed to calquing the Old French *wh*-item *quant* (or perhaps Latin *quando*) as the temporal subordinator *when*.

Next, the emergence of subordinating *when* does not occur in isolation but is embedded in a context of broadly similar changes. A number of unambiguous subordinators (i.e., those that cannot function as main clause adverbs) develop at around the same time. Stockwell & Minkova (1991: 383) mention "*till, because, while, before, after, since, unless.*" To those could be added *lest* (López-Couso 2007), *albeit* (Sorva 2007) and perhaps *(al)though* (Lenker 2010). Moreover, Middle English is in the process of re-purposing *wh*-items for a wide array of relative constructions (e.g., Mustanoja 1960: 196-202, Allen

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the loss of conditioning word order patterns on the rise of subordinating *when*.

14 Some examples of Anglo-Norman influence on Middle English are the following: About 10,000 French lexemes are believed to have been borrowed during the Middle Ages (e.g., Kastovsky 2006). Anglo-Norman may also have provided templates for emerging Middle English syntactic structures, such as the formation of periphrastic adjectival comparison (e.g., González-Diaz 2008) or counterfactual non-finite perfect *have* after modals (e.g., Ingham 2010), etc.

1977: 191-201, Fischer, Kemenade, Koopman & Wurff 2000: 91-93), including but not limited to headed locative relative clauses (*there* > *where*), as in (22) (e.g., Yamakawa 1971), or free relative, inanimate complement clauses (*that* > *what*), as in (23) (e.g., Truswell & Gisborne 2015). This is analogous to the change in temporal adjunct clauses because they, too, are well conceptualized internally as (free) relatives.[15]

(22) a. Locative relative introduced by *there*

*in [the same place [**there** the grete batayle was]] ys*
in the same place there the great battle was is
grete tresoure hydde
great treasure hidden
'In the same place where the great battle was, a great treasure is hidden'
(CMMALORY,30.947) identity

b. Middle English innovation: place relativized by *where*

*I com but late oute of [the Waste Foreyste [**where** I*
I came but late out of the waste forest where I
founde the Rede Knyght]]
found the red knight
'I came only late out of the desolate forest where I had found the red knight'
(CMMALORY,667.4880)

(23) a. Complement free relative introduced by *that*

*Ich have y-doo [**þat** y schulde]*
I have done that I should
'I have done what I should' (CMPOLYCH,VIII,111.3726)

b. Middle English innovation: complement free relative formed with *what*

*here after y schal doo [**what** me nedeþ]*
here after I shall do what me needs
'Hereafter, I shall do what I need' (CMPOLYCH,VIII,111.3727)

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15 The various types of changes from *th-* to *wh-*items may progress at the same or at different times and rates of change. However, such potential identities or divergences are of no immediate concern to the research question of this paper and they are therefore not investigated any further. It is likely that enough material would exist to explore such connections. The corpora used here include 6,353 examples of temporal subordinators (*then* > *when*), c.1,750 examples of locative relatives (*there* > *where*) and c.1,250 examples of free nominal relatives (*that* >*what*).

Such developments may suggest the involvement of analogical reasoning or similar cognitive biases in the propagation of subordinating *when*. Put differently, the use of the temporal subordinator *when* may promote, and be promoted by, the use of other subordinators and *wh*-relatives in a network of co-related linguistic structures.

Finally, the specific societal structure of a speech community may play a role in language change. In essence, more respected speakers may bestow an advantage on the linguistic forms they carry, or prestigious forms may, relatively consciously, be preferred over stigmatized ones (e.g., Croft (2000), where this criterion does in fact seem to be the only relevant factor in selection). The specific sociolinguistic context of Middle English cannot be fully reconstructed. Yet it does not seem too far-fetched to speculate that subordinating *when* may have been preferred by influential, well-connected social classes, or that society refrained from developing prescriptive pressures against its use that would have reduced its currency at least in the written record.

The hypothesis that the loss of subject-verb inversion after main clause adverb *then* had a causal influence on the rise of subordinating *when* stands independently of whether or not one agrees with the broadly evolutionary framework of linguistic changes outlined above. That is to say, it is possible to posit a causal link between the two developments irrespective of its underlying explanation, be it an evolutionary advantage that increases a form's probability of use, as suggested here, a functional repair strategy, or some other mechanism. The claim of a causal association between two factors itself can be tested, rather than its theoretical justification.

Hence, I will now set about investigating this hypothesis without further speculations on potential evolutionary mechanisms of change. The following subsection will be concerned specifically with the derivation of two empirically testable predictions that should be true if the posited causal association holds.

3.3   *Derivation of testable predictions*

If it is the case that the loss of verb-second order after *then* has a causal influence on the rise in subordinating *when*, then the former change should occur earlier than the latter. This follows simply from the assumption that a cause has to precede its effect in time. Moreover, the starting point of the syntactic change should not lag far behind the onset of the change in morphological realization of the subordinator. The reason for this is that causes and effects usually occur in close temporal proximity to each other, at least where the cause is a sufficient one.

The first hypothesis does not query the causal link between the two changes in a strong way. Rather, the test is a straightforward falsification attempt. If the time course of the two changes is not as predicted, then one can dismiss directly and quite incontrovertibly the hypothesis of a causal association between them.

(24) *Prediction 1: Time course of decline in subject-verb inversion after* then *and rise in* when
      If one measures the decline in subject-verb inversion after *then* and the rise in subordinating *when*, one should find that the former change commences earlier than, but is not implemented excessively before, the onset of the latter change.

Secondly, if the decline in subordinating *then* is due to the loss of syntactic word order cues for its interpretation, then the declining effect should be reduced if the subordinate reading is signaled through other means. In other words, the incidence of the conservative *th*-forms should survive more robustly if the temporal adjunct clauses involve alternative subordinating strategies.

This second test targets the causal influence of the syntactic development on the change in the realization of the subordinator form more directly. An effect of alternative subordinating strategies in the predicted direction is expected if increasing indistinctness of *then* as an adverb or subordinator is a causal motif for the recruitment of subordinating *when*, but would not be easy to account for otherwise or would have to be regarded as purely accidental.

(25) *Prediction 2: Effect of alternative subordinating strategies*
      If the temporal subordination data is subdivided into those cases that involve an alternative indication of embedding and those cases that do not, one should find an overall lower probability of *when* in the former than the latter context.

3.4   Summary

This section argued that the loss of distinctive word order patterns conditioning the interpretation of *then* is a causal factor in the rise of *when*. One possible mechanism implementing this causal link might be an evolutionary advantage of the innovative form increasing its probability of use. Irrespective of the specific theoretical rationale, two specific empirical predictions were suggested that can test the plausibility of the proposed causal association.

4 Hypothesis testing

I will now put the hypotheses derived in the previous section to the test. For each hypothesis, I will first describe the data collection process and then evaluate the results.

4.1 Hypothesis 1: time course of decline in subject-verb inversion after then *and rise in* when

According to my first hypothesis, subject-verb inversion after *then* should decline earlier than, but should not have progressed very far by the time of, the rise in *wh*-based subordination. This assumption can be investigated straightforwardly by measuring the syntactic patterns after adverbial *then* and compare the finding to the progression of the rise in subordinating *when*.

4.1.1 Data collection

I measured the decline in subject-verb inversion after adverbial *then* as follows. I counted all main clauses which the adverb *then* immediately precedes a finite verb which in turn precedes an overt subject (*then*-V...S), as in (26). Negation was allowed intervene between *then* and the finite verb. Subsequently, I collected all parallel main clauses, for which the adverb *then* is immediately followed by an overt subject and subsequent finite verb (*then*-S...V), as in (27).

(26) Conservative *then*-V...S

Þonne scalt þu, erming, up arisen
then shall you miserable up arise
'Then you, wretched, will rise up' (BodySoul,186.7.16.FragE)

(27) Innovative *then*-S...V

Þonne þu scalt iheren þene hearde dom
then you shall hear the hard doom
'Then you will hear your hard judgment' (BodySoul,201.7.35.FragE)

In general, the main clause adverb *then* occurs in first position in the clause in these alignments. However, conjunctions, prepositional phrases, subordinate clauses, temporal modifiers and parenthetical expressions were explicitly allowed to precede *then* as well, as in (28).

(28)   a. conservative *then*-V...S, preceded by temporal modifier and subordinate clause

> *[ofte   tyme], [if o man be wrooth with another],* **thanne**
> often times if a man be wroth with another then
> *wole he flatere som   wight*
> will   he flatter some wight
>
> 'Often, if a man is angry with another, then he will flatter someone'
> (CMCTPARS,308.C1.841)

b. innovative *then*-S...V, preceded by conjunction and prepositional phrase

> *[And] [after this],* **thanne** *shul ye   examyne   the seconde*
> and   after this   then   shall you examine the second
> *condicion*
> condition
>
> 'And after this, you should consider the second condition'
> (CMCTMELI,228.C1.429)

All other phrases were prohibited from clause-initial position. This resulted in the exclusion of, for example, initial nominal phrases, where *then* is probably situated lower in the clause, as in (29a), initial interjections, with which *then* may form a single constituent (Walkden 2013), as in (29b), etc.

(29)   a. deliberately not retrieved – nominal argument + *then*

> *&   him   **ða**   swa fela   gereorda   gelamp,*
> and them then so   many languages happened
> 'and then so many languages came into existence for them'
> (cowulf,WHom_12:7.1160)

b. deliberately not retrieved – interjection + *then*

> *Hwæt **ða**   Noe   eode   in to ðam arce,*
> what   then Noah went in to the   arc
> 'Lo! Noah went into the arc' (cootest,Gen:7.7.306)

The search queries may result in one type of potential recall error. The data set does not include clauses with phrases intervening between clause-initial *then* and the subsequent element, either verb or subject. Yet some such structures could plausibly fall within the envelope of variation. Examples of intervening temporal prepositional phrases are shown in (30a) for V...S order

and in (30b) for S...V order. It is difficult to establish exactly what kinds of elements should be counted as permissible interveners, perhaps only "scene setters" (e.g., Kroch & Taylor 1997), and even more difficult to retrieve all and only such items from the corpora. I therefore did not attempt to collect such structures at all.

(30)   a. perhaps recall error - conservative *then*-PP-V...S

   Than *[within a whyle] cam   sir Galahad   there   [...]*
   then   within a while   came Sir Galahad   there   [...]
   'Then, within a [short] while, Sir Galahad came to the place [...]'
   (CMMALORY,640.3956)

   b. perhaps recall error - innovative *then*-PP-S...V

   Thenne *[within two yeres] kyng Uther felle seke of a*
   then   within two years king Uther fell sick of a
   grete   maladye.
   great   malady
   'Then, within two years, King Uther fell seriously ill'
   (CMMALORY,6.155)

The resulting data set is well suited to quantify the overall influence of time on the variation between inversion and non-inversion after *then*. Indeed, the general effect of time is what is at issue with regard to the first hypothesis. Yet many other, uncontrolled factors may exert a considerable influence on the variation as well. I will leave the construction of a more comprehensive model of inversion after *then* for future research. For now, I will simply present a list of variables that are known to affect inversion in general and may hence also constrain subject-verb inversion patterns after *then* in particular: (i) Dialect may play a role with Northern texts likely displaying higher rates of inversion (e.g., Kroch & Taylor 1997, Trips 2002). (ii) Verb type might exert an influence in such a way that inversion occurs more frequently with unaccusatives, like *come*, *follow*, the verb *be*, passives, modals (e.g., Kemenade 1997, Warner 2007, Kemenade & Westergard 2012) and verbs of saying (e.g., Cichosz 2017) than with transitive or unergative verbs. (iii) Subject properties could be a relevant factor since Middle English full subjects invert more than pronominal subjects (Haeberli 2002) especially if they are focused, generic and indefinite rather than given and definite (Kemenade 2012). (iv) On the whole, between-text (and probably also between-item) variability of inversion is substantial. For example, Haeberli points out that "while some texts in the period m3 [1350-1420] have reached a PDE-like stage

formula = Inversion ~Year + (1 | Text), family = binomial, data = Hypothesis1

Fixed Effects

	Estimate	Std. Error	z-value	p	
Intercept	12.230	1.050	11.644	<0.001	***
Year	-0.00807	0.001097	-7.3531	<0.001	***

Random Effect

Texts	N=148
Variance of random intercepts	2.184

Null deviance	6968 on 5617 degrees of freedom
Residual deviance	4311 on 5615 degrees of freedom
AIC	4317

Table 2 Mixed-effects logistic regression model for the loss of inversion after main clause adverb *then*

with hardly any inversion, others from the same period still have inversion rates of well over 50%" (2007: 20).

4.1.2 Results

The search queries returned 3,869 hits of the conservative variant *then*-V...S and 1,749 hits of the innovative variant *then*-S...V, i.e., a total of 5,618 examples. Table 2 presents a mixed-effects logistic regression model that predicts inversion after main clause adverb *then* from time and includes a random text effect.

The model is represented graphically in Figure 3. It should be interpreted analogously to Figure 2 for the rise of *when*. The model returns a rate for the decline in inversion after *then* of -0.008 log-odds per year. This is a remarkably slow change. The use of inversion would be expected to drop from 99% to 1% in 1039 years. The time predictor is highly significant in this model. Despite the rudimentary nature of the model, it likely estimates the time parameter adequately. First, the finding is in accordance with previous studies. Baekken (2000: 400) presents counts of inversion after *then* grouped into three periods, 35.8% in 1480-1530, 47.6% in 1580-1630, and 2.6% in 1680-1730. Similarly, Nevalainen (1997: 209) counts 40% in 1420-1500, 40% in 1500-1570, 14% in 1570-1640 and 12% in 1640-1710 in the *Helsinki Corpus*, and 12% up to 1522, 30% in 1523-1562, 21% in 1563-1602 and 12% in 1603-1642
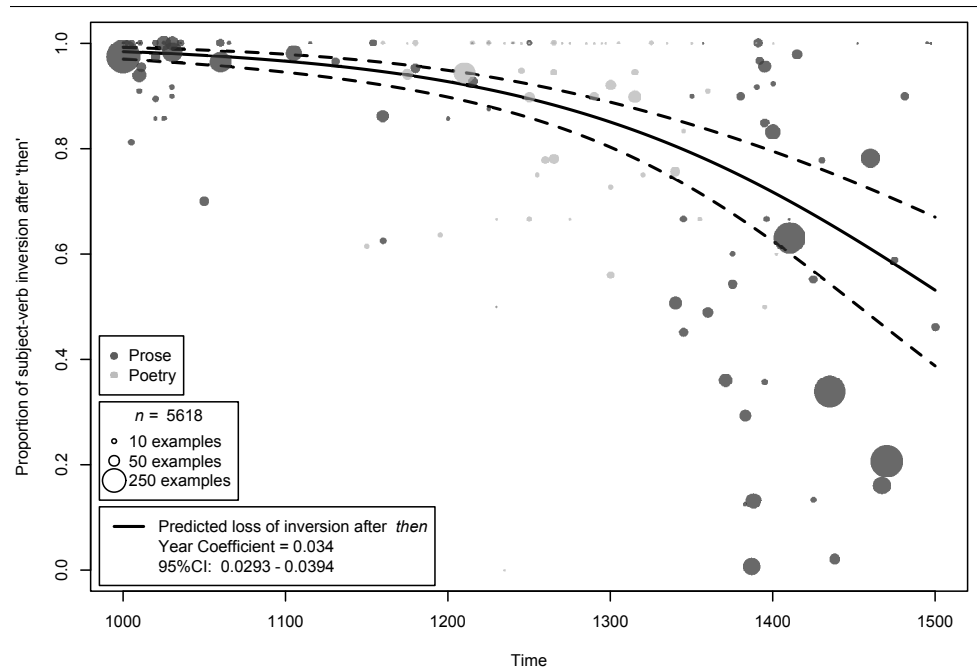
Figure 3   Mixed-effects logistic regression model for the loss of inversion after main clause adverb *then*

in her *Corpus of Early English Correspondence*. Abstracting away from critical issues with this data, such as small sample size, binning, and lack of control for correlated errors on the text level, extrapolations from my model do not diverge greatly from these percentage values, e.g., 53% [95%-confidence interval: 39%-67%] for 1500, 33% [95%-confidence interval: 19%-52%] for 1600 and 18% [95%-confidence interval: 8%-37%] for 1700. Secondly, the slow rate of change is also plausible because Present-Day English still allows inversion after *then*, especially with unaccusatives (*Then comes the greatest loss of all*, BNC C8Y 4), verbs of saying (*Then says Mr. Daniel, '[...]'*, BNC H81 183) or for poetic license (*Then dreams he of another benefice*, BNC A06 409).

The data comes from 148 texts, 58 texts not featuring any instances of main clause adverb *then*. There is great between-text variation as shown by a relatively large variance parameter of 2.18. This finding mirrors the great degree of variability of Middle English verb-second patterns in general. For example, individual texts from around 1400 can vary in their rate of inversion after *then* between 0% (e.g., *Trevisa's Polychronicon*, c.1387, 0.7%,

N=139) and 100% (e.g., *Chaucer's Treatise on the Astrolabe*, c.1391, 100%, N=37). This suggests that additional factors constrain the variation in important ways.

Given such great variability, it is not surprising that the model fits the data only moderately well (Pseudo-$R^2_{marginal}$= 0.269, Pseudo-$R^2_{conditional}$= 0.560). The model has acceptable classificatory power (C-index= 0.902, classification accuracy= 83.9% vs. baseline: 68.9%).

One can now use the quantification of the time effect on inversion after *then* to test Hypothesis 1. The model for main clause *then* returns the year 946 as the moment when the probability of uninverted 'subject - verb' order after this adverb first exceeded the 1%-threshold. In contrast, the model for subordinating *when* predicts that it was not before the year 1079 that there was a 1%-chance of finding this item as a temporal subordinator. Therefore, the time courses of the two changes conform to the expectation of Hypothesis 1 – subject-verb inversion after *then* does indeed begin to fluctuate earlier, by more than a century, than the onset of the change in subordinator form. Next, it is possible to use the same models to estimate how much the first change has progressed by the time the second change commences. The probability of finding the main clause adverb *then* followed by verb-second order in the year 1079, i.e., the inception point for the rise in subordinating *when*, is calculated as 97.1%. Thus, the decline in verb-second order had advanced only slightly by the time *when* began to be innovated as a temporal subordinator. This result, too, is compatible with Hypothesis 1 - the loss of verb-second order after *then* has not progressed so far relative to the onset of the innovation in subordinator form as to make a causal association between them implausible. In short, the evidence supports Hypothesis 1.

4.2   *Hypothesis 2: Effect of alternative subordinating strategies*

The second hypothesis states that the probability of finding *when* as a subordinator should be lowered in constructions that signal the dependent nature of the temporal adjunct clause through independent means. The reason is that such contexts should attenuate the effect of the loss of disambiguating word order and hence safeguard subordinating *then*. The prediction can be tested by using the presence or absence of an alternative subordinating strategy as a predictor for the formal realization of temporal subordinators.

Three relevant alternative subordinating strategies are commonly identified in the literature: (i) correlative constructions, (ii) doublings, and (iii) overt complementizers (Mitchell 1984: 273, Kortmann 1996: 308-312, Declerck 1997: 58-59). These constructions can be conceptualized as cues directing expectations about the structure of a clause. While they cannot guarantee

the interpretation of *then* as a subordinator with absolute certainty, they nevertheless all greatly increase the probability of such a parse.

4.2.1 Data collection

(i) Correlative constructions. Early English correlative constructions involve an initial temporal subordinate clause locating an event in time and discourse and a subsequent, resumptive adverb *then* establishing the reference time relative to the event expressed in the main clause (e.g., Kemenade & Los (2006), Links (2018), Kemenade & Links (2020); for a short historical summary, see Fischer et al. (2000: 88-89)). Typical examples are shown in (31), where the initial clause and its resumptive adverb bear the same index.

(31)   a. *[þa   he   lai   an   slep   in   scip]$_i$ þa$_i$ þestrede   þe   dæi*
             then he   lay   in   sleep   in   ship   then darkened   the   day
          ouer   al   landes
          over   all   lands
          'When he lay asleep in the ship, then the day became dark in all the lands' (CMPETERB2,54.380)

       b. *[wanne   þi   lust   is   ago]$_i$,   þonne$_i$*
             when   your   lust   is   gone   then
          is   þi   song   ago   also
          is   your   song   gone   also
          'When your desire has passed, then your song has passed as well' (OwlNight,46.508.296)

The pattern *then...-then* or *when...-then* effectively functions as a cue for the status of the first item as a temporal subordinator. That is so because correlatives are conventionalized, frequent patterns priming anticipation of a word order alignment in which there first appears a clause and then a resumptive adverb. Indeed, the inverse order with an initial adverb and a subsequent clause is exceedingly rare. I found only 16 relevant examples in my dataset, i.e., of the type illustrated in (32). That examples with such a reverse alignment are unidiomatic and hard to process may also be reflected by a certain stylistic awkwardness of their modern English translations.

(32) a. ***Þo*** *was Ihesus of twelf ȝer [Þo he desputede*
      then was Jesus of twelve years then he disputed
      with heom þer]
      with them there
      'Then Jesus was twelve years old when he disputed with them
      there.' (LAUD108AINFANCY.1184)

   b. ***þan*** *trowed I stedfastly [**when** I had sene þat sight]*
      then trusted I steadfastly when I had seen that sight
      'Then I became a firm believer when I had seen that miracle'
      (Nicodemus,90.[Stanza_89].1066.598)

Furthermore, the idea that correlatives are a form of alternative sub-ordinating strategy is a frequent claim in the specialist literature. The *then...-then* pattern is said to have had a "disambiguating function" (Kortmann 1996: 312) because "in such sequences [...] parataxis in structure naturally passed on to hypotaxis, thus conditioning the [initial] demonstrative to turn into [read 'to be interpreted as'] subordinating conjunctions" (Yamakawa 1969: 41). Speakers expect that "correlatives have a temporal, discourse-sequencing effect: the subclause is in initial position [...] while the resumptive adverb introduces the main clause (Kemenade & Links 2020: 10-11).

(ii) Doublings. Old and Middle English *then* and *when*-clauses sometimes function as relative clauses restricting temporal heads (see examples (4) and (11c)). However, it is not always clear whether a temporal phrase preceding a temporal subordinate clause functions as its proper antecedent (e.g., restrictive [*the day* [*when*...]]), or if the two constituents are mutually unembedded functions of a higher element (e.g., appositive [*the next day*] [*when*...]).[16] Therefore, temporal adjunct clauses after temporal heads are not regarded in general as a structure signaling embedding with a very high degree of certainty. However, if the temporal head is itself the adverb *then*, the resulting pattern is so frequent and grammaticalized that it can safely be classified as a conventionalized expression of subordination (e.g., "the double form *þa þa*" Wårvik (1995: 350). Note that "[d]oubled *þā* [...] *usually* [italics mine] introduces a subordinate clause" (Mitchell & Robinson 1964: §151). This is true regardless of whether or not one adopts the analysis of such doublets as a pair of antecedent plus relative operator / relativizer (as opposed to one fused subordinator). Examples are shown in (33).

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16 This ambiguity is also reflected in variable annotations in the parsed corpora (e.g., [*a tyme* [*whan kynge Arthure was at London*]] parsed as a headed relative clause, CMMALORY,45.1483 vs. [*þe fyrst tyme*] [*when a man es turned to God*] parsed as two independent, non-embedded phrases, CMROLLEP,78.245).

(33) a. *[þa   þa   me   hine to beheafdunge lædde [...]]*
      then then one him   to beheading   led   [...]
    'When he was led to his beheading [...]'
    (cojames,LS 11[James]:110.102)

    b. *[þanne **huanne** we ziggeþ 'vader oure' [...]]*
      then   when   we say   father our   [...]
    'When we say the Lord's Prayer [...]'
    (CMAYENBI,101.1985)

(iii) Overt complementizers. In Modern English, the co-occurrence of an initial operator and a subsequent complementizer is generally precluded (the "doubly filled COMP filter" in Chomsky & Lasnik (1977) and much subsequent work), but in earlier stages of the language, this restriction applied much less rigorously. Hence, Old and Middle English temporal adjunct clauses, among many other clause types, can occur with overt complementizers such as Old English *þe* or Middle English *that* (e.g., Allen 1977: 256-259, Maling 1978, Nawata 1999). Illustrations of overt complementizers in the patterns *then + þe*, *then + that* and *when + that* are provided in (34).

(34) a. *[þo   [þe   [he to helle cam]]]*
      then that he to Hell   came
    Sucche words he bigan:
    such   words he began
    'When he came to hell, he began speaking thusly'
    (HarrowHell,4.26.10)

    b. *[þo   [þat [ure louerd in hire was ikeint]]]*
      then that our Lord   in her   was conceived
    Engles from heuene on heiye weren isent
    angels   from heaven on high   were   sent
    'When our Lord was conceived in her, angels were sent from heaven on high' (LordOneGod,237.174.143)

    c. *And [**whan** [that [they knewe that they were naked]]],*
    and when   that they   knew   that they were naked
    they sowed of fige leves   a   maner   of breches
    they   sewed of fig   leaves a   manner of breeks
    'And when they realized that they were naked, they made some kind of pants from fig leaves' (CMCTPARS,297.C1.369)

The presence of a complementizer greatly increase the probability of a parse in which the *th-* and *wh*-items are subordinators. The reason is that

complementizers are virtually always associated with dependent clauses (for rare cases of matrix complementizers, see e.g., Colasanti & Silvestri (2019)). Incidentally, if one accepts the view that temporal adjunct clauses are internally structured as free relatives, these complementizers are best analyzed specifically as relativizers / relative complementizers. Nevertheless, even overt complementizers may not force a subordinator reading with complete certainty. "The presence of *þe* is not absolute proof that we have the conjunction rather than the adverb" (Mitchell 1984: 273).

I coded all examples in the subordinator data set for the presence or absence of these alternative subordinating strategies. I did not code for the specific type of alternative subordinating strategy, but merged all clauses that included any independent signal of subordination into one group. This was necessary because some clauses involved more than one indication of subordination. I ran search queries extracting instances of alternative subordinating strategies on the output files of the subordination data. The complement files of these queries then contained all instances of temporal clauses without additional cues of embedding. Thus, my search queries separated the data into four logically possible groups: the subordinator *then* without another cue for embedding (e.g., (1), (2a), (2c), etc.), the subordinator *then* with an alternative subordinating strategy, as in (31a), (33a), (34a), and (34b), the subordinator *when* as the sole indication of subordination (e.g., (2b), (2d), (3), etc.), and the subordinator *when* co-occurring with an additional signal of embedding, as in (31b), (33b), and (34c).

4.2.2 Results

Out of 6,353 temporal subordinate clauses in my data set, an additional marker of subordination is present in 952 examples (508 *then*, 444 *when*) and absent in 5,401 examples (1175 *then*, 4226 *when*). I traced the frequency of alternative subordinating strategies in temporal adjunct *then*- and *when*-clauses through time from c.1000 to 1500. The results can be summarized as follows.

The subordinator *then* is very likely to co-occur with an additional signal of embedding in late Old English texts, mainly doubling and correlatives. In fact, some texts from before c.1150 show the presence of an alternative subordinating strategy in more than 80% of all temporal *then*-clauses, for example, *The History of the Holy Rood-Tree* (53 out of 65 cases). The proportion of *then*-clauses including an additional signal of subordination subsequently declines quickly and levels off at c.10% in the thirteenth century, for instance, *Layamon's Brut* (8 out of 67 cases) or *Infancy of Christ* (3 out of 39 cases). Text files with a particularly low frequency of alternative subordinating

strategies from that time are the *South English Legendary* (2 out of 169 cases) or *King Alisaunder* (0 out of 43 cases). The development of *then*-clauses becomes difficult to track in the fourteenth century as the frequency of *th*-subordinators becomes vanishingly small overall.

The proportion of the subordinator *when* involving alternative subordinating strategies is hard to estimate before c.1200 on account of the low number of relevant examples. Its average frequency in the thirteenth century may range between 5% and 10%, for example, *Ancrene Riwle* (9 out of 157 cases), *The Owl and the Nightingale* (4 out of 39 cases) or *Cursor Mundi* (12 out of 123 cases). From the early fourteenth century on, there is a steady increase in the employment of additional cues for embedding, reaching a peak in the early fifteenth century at c.20%, for example, *Mirk's Festial* (79 out of 390 cases) or *Treatise on Horses* (6 out of 26 cases). The text file featuring the highest frequency of *when* with alternative subordinating strategies, mainly overt complementizers, is *Sermons from Ms. Royal* (11 out of 19 cases). Subsequently, the prevalence of *when*-clauses with additional signals of embedding begins to drop again.

Figure 4 illustrates the history of the proportion of alternative subordinating strategies in temporal *then* and *when*-clauses. The graph presents the development in the form of data points for every text and smoothing Loess curves with their 95%-confidence intervals in light grey for *then* and in dark grey for *when*.

Thus, relevant examples of alternative subordinating strategies exist throughout the Middle English period. It should therefore be possible to quantify their effect on the realization of temporal subordinators. However, the frequency of alternative subordinating strategies is relatively low overall (less than 1,000 examples, a prevalence of only c.10% of all temporal adjunct clauses during the transitional period c.1125-1375). The model estimates can therefore be expected to be relatively uncertain.

Table 3 presents a mixed-effects logistic regression model that predicts the realization of the subordinator as a *wh*-item not just from time but also from the presence of alternative subordinating strategies and the interaction between the two variables while controlling for random text variability.

The model estimates an increase in the log-odds of *when* of 0.033 for every additional year that the change progresses. The 'Year' variable is a highly significant predictor in this model. 167 texts contributed to the data set whose random intercepts show a very substantial variance of 3.68. The model performs well. It presents an adequate fit to the data (Pseudo-$R^2_{marginal}$= 0.766, Pseudo-$R^2_{conditional}$=0.889) and has very good classificatory power classifying considerably more cases correctly than the baseline (C-index=
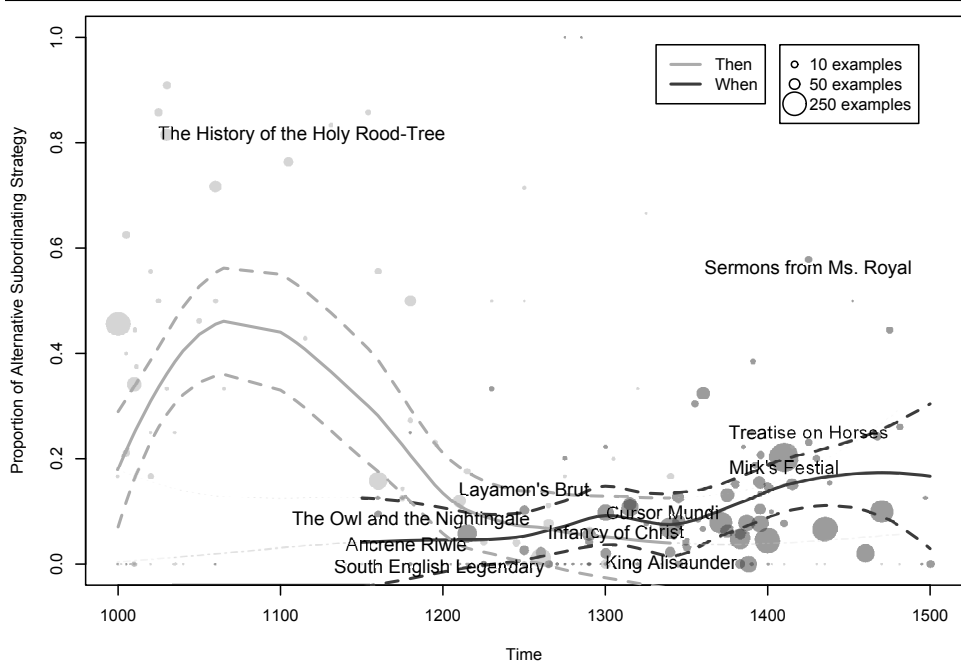
Figure 4   Development of frequency of alternative subordinating strategies in *then-* and *when-*clauses

0.983, classification accuracy= 93.9% vs. baseline: 73.5%). These findings restate the effects of my earlier model for the rise of *when* as a temporal subordinator presented in Section 2.4.

The third row in Table 3 lists the crucial variable for the investigation of the present hypothesis. It estimates the change in the probability of *wh*-based temporal subordination as the level of the variable 'alternative subordinating strategy,' (abbreviated 'AltSubStr') is changed from 'absent' to 'present.' If an additional signal of embedding is found in a temporal clause, its base probability of being introduced by the item *when* is reduced by -0.56 log-odds. The effect is statistically significant at the 5%-level in this model. This finding is in accordance with Hypothesis 2 – the presence of an alternative subordinating strategy significantly increases the probability of encountering a conservative temporal *then*-clause. For example, the model predicts that temporal clauses without an alternative subordinating strategy first have a 1%-chance of realizing their subordinator as *when* in the year 1077 whereas temporal clauses with such a strategy would not break through the same

formula = Inversion ∼ Year + AltSubStr + Year:AltSubStr + (1 | Text)
family = binomial, data = Hypothesis2

Fixed Effects

	Estimate	Std. Error	z-value	p	
Intercept	-39.899	-3.533	11.293	<0.001	***
Year	0.0328	0.00249	13.147	<0.001	***
AltSubStr (Absent→Present)	-0.5605	0.2845	-1.970	0.0488	*
Year:AltSubStr (Absent→Present)	0.0075	0.00313	2.413	0.0158	*

Random Effect

Texts	N=167
Variance of random intercepts	3.683

Null deviance	7346 on 6352 degrees of freedom
Residual deviance	2053 on 6348 degrees of freedom
AIC	2063

Table 3 The loss of subject-verb inversion after main clause adverb *then*

threshold before the year 1118. In brief, the evidence supports Hypothesis 2 as well.

The final variable of the model estimates the difference in the rate of change as an alternative subordinating strategy is added to a temporal subordinate clause. The activation of this condition is predicted to accelerate the rate of change to an increase of 0.0328 + 0.0075 = 0.0403 log-odds of subordinating *when* per year. The interaction term is significant at the 5%-level in this model. The inclusion of the variable is also justified by a likelihood ratio test on the difference in residual deviance between a model without the interaction term and the above model with the interaction term ($\chi^2 = 7.04$, df=1, p=0.008**). The use of *wh*-based temporal subordination may rise more rapidly in the context with alternative subordinating strategies than in the context without them because of the overall lower relative frequency of innovative vis-à-vis conservative temporal subordination in the former than the latter context combined with a simultaneous disappearance of conservative *then*-clauses in both contexts. At any rate, the divergence does not directly impact the expectations expressed in Hypothesis 2.

Figure 5 illustrates the development of temporal subordinators with and without alternative subordinating strategies. The data points represent the frequency of *wh*-based temporal subordination for each text file. Their size
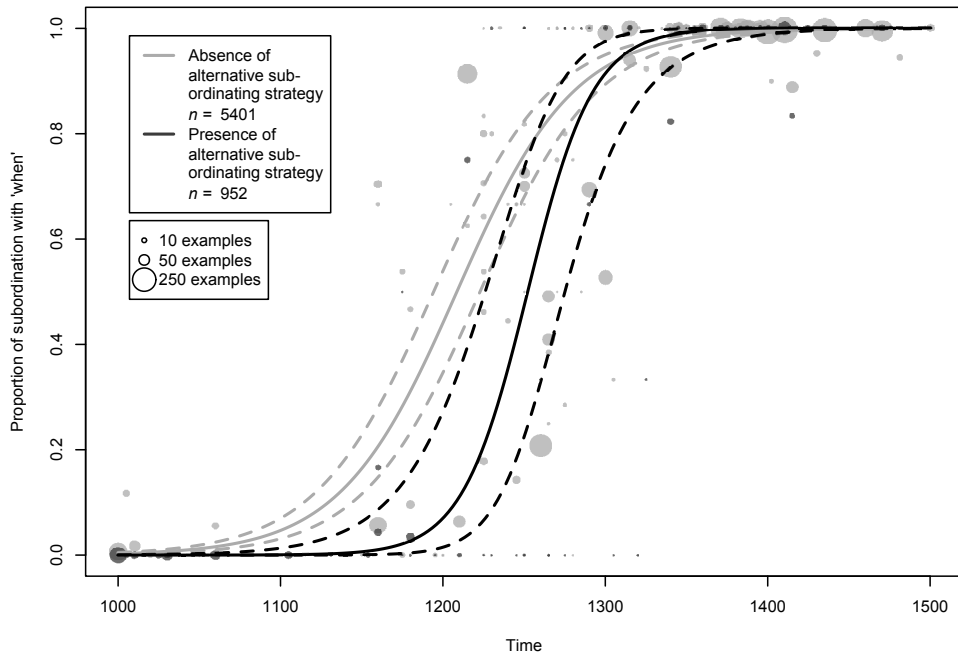
Figure 5   Rise in subordinating *when* by absence and presence of alternative subordinating strategies

is proportional to the number of examples they contain. Cases without alternative subordinating strategies are shown in light grey, occurrences with alternative subordinating strategies in dark grey. The graph also presents the regression curves and their 95%-confidence intervals for these two contexts in the same respective colors. The wide bands for the second context show that there is substantial uncertainty regarding the true rate of change, due to the rather small sample size. However, one can clearly see that the dark grey line indicating temporal clauses strengthened by a supplementary subordination strategy falls below the light grey line representing ordinary temporal clauses without such a strategy, which highlights the support adduced for Hypothesis 2 – temporal *then*-clauses co-occurring with an independent signal of subordination seem to survive more robustly than their bare counterparts without such reinforcement.

5 Discussion

Historical syntacticians often postulate fairly deterministic links between a sufficient cause and a subsequent linguistic innovation. For instance, one may read about specific triggering experiences constituting relevant cues to set a syntactic parameter (as in Lightfoot (1999) and similarly in Roberts (2007) and related work), or one can find claims to the effect that a linguistic variant is picked if it is socially appealing (Croft 2000). Such approaches can be fruitful when they are empirically testable and provide conceptual frameworks. They are also often quite sophisticated, leaving room for some non-predictable mechanisms of change and stressing the role of cognitive biases or constraints in various forms (e.g., Clark & Roberts 1993).

Nevertheless, I caution against formulations of causes for linguistic changes in such deterministic terms. Specifically, I do not claim that the loss of subject-verb inversion after main clause adverb *then* causes the rise of *wh*-based subordination *per se*. Rather, the two developments are causally associated, the former facilitating the latter as one causal motif within a complex linguistic and extra-linguistic network of influencing factors. Indeed, I could list a relatively large number of potential reasons for the rise of subordinating *when*: Analogical pressure may have been exerted by a general rise in unambiguously hypotactic connectors and new *wh*-based relatives; French influence may have played a role; the decline in the prevalence of alternative subordinating strategies in late Old English *then*-clauses might constitute a causal motif in its own right; Yamakawa (1969: 31, fn. 79) suggests that homophony between *þo* 'then' and *þo* 'those' might have given an advantage to the unambiguous form *when*, etc. It does not seem too far-fetched to assume that such a multi-factorial conception of determinants for linguistic changes can offer more comprehensive explanations in general and not just in the specific case investigated here.

I suggested that the indeterministic nature of linguistic innovation can be conceptualized in terms of evolutionary dynamics. I shall stress that this conceptualization has no immediate methodological consequences and that parallels with biological evolution should not be carried too far. The results of my hypothesis tests stand independent of the specific approach to linguistic change one wishes to adopt. However, an evolutionary perspective on change can inoculate against overly mechanistic thinking. For the case at hand, I illustrated evolutionary reasoning by laying out a case for low adaptability of *then*-based subordination in a grammatical environment in which conditioning verb-second patterns after adverbial *then* are disappearing. The idea is that such a grammar will open up the opportunity for an innovative form to intrude on the linguistic space of its conservative competitor but

does not make such a development inevitable.

The claim that cognitive, social and cultural conditions of a change are too complex to allow the identification of a sufficient antecedent cause does not entail that it is impossible to test causal associations at all. One can isolate a specific potential causal influence on a linguistic innovation and attempt to derive empirically falsifiable predictions targeting the causal relation between the two dimensions. This is not a trivial task. It is often hard enough to demonstrate just that an alleged link between some predictor and a linguistic outcome can at least be regarded as plausible to begin with. Still, linguists should not be satisfied with mere demonstrations of plausibility but try to corroborate assertions of supposed causes for a change independently with hypothesis tests that could realistically falsify such claims. In the present study, I provided some evidence for my contention that word order changes contribute to the rise of subordinating *when* in the form of two hypothesis tests. The first test investigated the observed time courses of the two potentially linked developments. This kind of test may generalize to many different phenomena and could also help to tackle the "chicken-and-egg problem" (Roberts 2007: Ch. 2), the difficulty in determining whether reanalysis (ambiguity in *then*) causes innovation (subordinating *when*) or vice versa. The second test found an effect of alternative subordinating strategies, which is expected under my explanation but might not be expected under alternative explanations. This kind of test is more "creative" and specific to a particular phenomenon, but has greater potential to illuminate causal relations themselves.

I managed to investigate only one hypothesized causal influence on a linguistic change in isolation. In theory, however, it would be possible to reconstruct an entire network of causal associations statistically. Such endeavors are usually frustrated by limited data and the present study is no exception. For example, in order to evaluate the influence of contact with French on a par with changing word order patterns, one would require a sufficient number of texts to fill in all cells of a contingency table of size 2 (*th*- vs. *wh*-based subordinator form) x 2 (SV vs. VS word order after main clause adverb *then*) x 2 (high vs. low French influence) across different time points. The surviving Middle English text corpus is too small for such a set-up and might not even allow it in principle since the proportion of V2 after *then* and the degree of French influence, confounded by time, would likely be highly correlated with each other. If a comprehensive model targeting multiple potential causal factors could be built, one might be in a position to substantiate the very assumption of multi-factorial (rather than deterministic) factors in language change. Such a project may therefore be a valuable goal

for the future.

6 CONCLUSION

This paper tested the hypothesis that the Middle English rise in subordinating *when* is causally associated with the loss of word-order patterns disambiguating the proper interpretation of the item *then*. I tested two hypotheses designed to falsify this explanation. The test of Hypothesis 1 showed that the change in word order patterns after main clause adverb *then* was just beginning to obscure its proper interpretation by the time *when* was recruited as a subordinator. The relative timing of the two changes under consideration is thus compatible with a causal association between them. The proposed explanation for the development of subordinating *when* in terms of an internally triggered change does not strictly speaking receive positive corroboration from this test. However, the result does mean that the explanation has survived a realistic falsification attempt so that its correctness becomes somewhat more probable. The test of Hypothesis 2 revealed that the occurrence of a temporal subordinate clause introduced by *then* is significantly more likely if an alternative subordinating strategy is present than if it is not. This finding may offer some positive evidence for the correctness of the proposed causal influence of word order changes on the formal realization of temporal subordinators. The fact that an additional signal of subordination seems to protect *then* from being ousted by *when* to a certain degree suggests that the unequivocal recognition of *then* as a main clause adverb or as a subordinator plays an important role in the change. This, in turn, supports the assumption that the perturbation of the interpretability of *then* due to the loss of verb-second order after its function as a main clause adverb should exert a causal influence on the adoption of *when* as a new temporal subordinator.

I have pointed out open questions and possible extensions throughout this paper (see in particular Section 2.1. and the end of Section 4.1.1.), and I will refrain from repeating them here. Instead, I will raise a few broader questions. First, are there other testable predictions that could lend more credence to the conjecture that the development of *when* as a subordinator can in part be attributed to the loss of conditioning word order patterns? Despite close reflection, I found it impossible to conceive of an additional, independent test of the proposed causal explanation for the time being. Second, if one could, how would one model a network of multiple mutually constraining linguistic influences that, taken together, make a linguistic change more likely than not? Perhaps more sophisticated, multi-factorial analyses or structural equation modeling, commonly used in psychology, can be helpful

to assess the effects of unobserved, latent causes on linguistic innovations. Finally, is it possible to test not just causal associations between two linguistic developments, but also the cognitive foundation of such changes, in particular in terms of evolutionary dynamics vs. functional pressures? For example, the result of the second hypothesis test can be interpreted in both frameworks. In evolutionary terms, unambiguous identification of *then*'s grammatical role under the presence of independent cues for subordination lowers the advantage of innovative *when* over conservative *then* so that the intruding form cannot easily assert itself in that context. In functional terms, a supplementary marker of embedding for *then*-clauses would reduce the need for speakers to introduce a new, unambiguous subordinator. It is very difficult to see what sorts of observations could differentiate between these two perspectives.

It is of course impossible to prove definitively that one linguistic change causally influences another linguistic change. Indeed, the present paper does not even produce enough evidence to force its proposed causal association beyond reasonable doubt. However, many studies claim that one linguistic change could directly contribute to the emergence of a subsequent one without any quantitative tests of the causal explanation at all (e.g., Los (2009) on the proposal that the loss of verb-second causes new aspects of the syntax of subjects). This paper therefore constitutes a rare example of a study that actually provides quantitative, empirical support for a supposed causal association between linguistic changes. As far as such things go in diachronic syntax, the causal influence of changing word order patterns after *then* on the rise of subordinating *when* can be regarded as a case of a system-internal motivation for language change that has been examined in sufficient detail to become truly probable.

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APPENDIX A

The following table lists the 206 electronic text files used in this study. It presents their corpus file names, a more conventional text name, their source corpus, an estimated year of composition, as well as their assigned genre.

File Name	Text Name	Corpus	Year	Genre
coepigen	Epliogue Genesis	YCOE	1000	Prose
colwgeat	Ælfric's Letter to Wulfgeat	YCOE	1000	Prose
colwsigeXa	Ælfric's Letter to Wulfsige	YCOE	1000	Prose
cootest	Heptateuch	YCOE	1000	Prose
coprefgen	Preface Genesis	YCOE	1000	Prose
colwstan1	Ælfric's Letter to Wulfstan I	YCOE	1002	Prose
coalcuin	Alcuin De Virtutibus et Vitiis	YCOE	1005	Prose
colsigef	Ælfric's Letter to Sigefyrth	YCOE	1005	Prose
colsigewZ	Ælfric's Letter to Sigeweard	YCOE	1005	Prose
colaw5atr	Laws, Æthelred V	YCOE	1008	Prose
colaw6atr	Laws, Æthelred VI	YCOE	1008	Prose
cocanedgD,X	Canons of Edgar	YCOE	1010	Prose
coinspolX	Wulfstan's Institute of Polity	YCOE	1010	Prose
colaece (part)	Bald's Leechbook (Book 3)	YCOE	1010	Prose
colwstan2	Ælfric's Letter to Wulfstan II	YCOE	1010	Prose
covinceB	Saint Vincent	YCOE	1010	Prose
cowulf	Wulfstan's Homilies	YCOE	1010	Prose
cobyrhtf	Byrhtferth's Manual	YCOE	1011	Prose
codocu3.o3,4.24 (part)	11th Cent. Charters	YCOE	1020	Prose
colacnu	Lacnunga	YCOE	1020	Prose
colaw1cn	Laws, Cnut I	YCOE	1020	Prose
colaw2cn	Laws, Cnut II	YCOE	1020	Prose
coapollo	Apollonius of Tyre	YCOE	1025	Prose
colawnorthu	Northymbra Preosta Lagu	YCOE	1025	Prose
conicodD	De Ascensione	YCOE	1025	Prose
coeust	Saint Eustace	YCOE	1030	Prose
cojames	Saint James	YCOE	1030	Prose
comargaT	Saint Margaret (T)	YCOE	1030	Prose
corood	Holy Rood-Tree	YCOE	1030	Prose
coadrian	Adrian and Ritheus	YCOE	1035	Prose
cosolsat1	Solomon and Saturn	YCOE	1035	Prose
colawger	Laws, Gerefa	YCOE	1040	Prose
comargaC	Saint Margaret (C)	YCOE	1050	Prose
benetholmet	Cartulary St Benet of Holme	P-LAEME	1050	Prose
cochronA,C,D,E (part)	Anglo-Saxon Chr., Mid-11th Cent.	YCOE	1060	Prose
chertseyt	Charters Chertsey Abbey	P-LAEME	1060	Prose
coleofri	Vision of Leofric	YCOE	1060	Prose
swinfieldt	Writ of Edward the Confessor	P-LAEME	1060	Prose
coneot	Saint Neot	YCOE	1065	Prose
creditonbt	Document Relating to Crediton	P-LAEME	1100	Prose
cochronA,C,D,E (part)	Anglo-Sax. Chr, Early-12th Cent.	YCOE	1105	Prose
colawwllad	Laws, William I, Lad	YCOE	1110	Prose

File Name	Text Name	Corpus	Year	Genre
coeluc1,2	Elucidarium	YCOE	1115	Prose
CMPETERB (part)	A.S. Chronicle, 1st Continuation	PPCME2	1131	Prose
WorcFrag	Worcester Fragment	PCMEP	1135	Poetry
TheGrave	The Grave	PCMEP	1140	Poetry
BodySoul	Body and Soul	PCMEP	1150	Poetry
CMPETERB (part)	A.S. Chronicle, 2nd Continuation	PPCME2	1154	Prose
CMLAMB1	Lambeth Homilies (OE removed)	PPCME2	1160	Prose
PatNost	Rhymed Pater Noster	PCMEP	1160	Poetry
CMTRINIT	Trinity Homilies (copies removed)	PPCME2	1160	Prose
CMORM	Ormulum	PPCME2	1175	Poetry
PoemaMorale	Poema Morale	PCMEP	1175	Poetry
gospatrict	Writ of Gospatric	P-LAEME	1175	Prose
ProvAlf	Proverbs of Alfred	PCMEP	1180	Poetry
CMVICES1	Vices and Virtues	PPCME2	1180	Prose
LordOneGod	Lord as Thou art One God	PCMEP	1195	Poetry
buryFft	Register of St. Edmunds Bury	P-LAEME	1200	Prose
creditonat	Three Documents on Crediton	P-LAEME	1200	Prose
Ureisun	A Good Orison of Our Lady	PCMEP	1205	Poetry
Layamon	Layamon's Brut	PPCME2 (Suppl.)	1210	Poetry
LofsongLady	A Lofsong of Our Lady	PCMEP (Suppl.)	1210	Prose
LofsongLord	A Lofsong of Our Lord	PCMEP (Suppl.)	1210	Prose
CMANCRIW1,2	Ancrene Riwle	PPCME2	1215	Prose
Maregrete	Meidan Maregrete	PCMEP	1215	Poetry
OrisonLord	An Orision of Our Lord	PCMEP (Suppl.)	1215	Prose
egsomert	Summer is Comen and Winter Gone	P-LAEME	1220	Poetry
Bestiary	Bestiary	PCMEP	1225	Poetry
CMHALI	Hali_Meidhad	PPCME2	1225	Prose
CMJULIA	Saint Juliana	PPCME2	1225	Prose
CMKATHE	Saint Katherine	PPCME2	1225	Prose
CMMARGA	Saint Margaret	PPCME2	1225	Prose
CMSAWLES	Sawles Warde	PPCME2	1225	Prose
tr323amisc	Short Verses Trinity 323 (Hand A)	P-LAEME	1225	Poetry
tr323bt	Short Verses Trinity 323 (Hand B)	P-LAEME	1225	Poetry
WiseAdmon	Wise Admonitions	PCMEP	1225	Poetry
jesdwc	Death's Wither Clench	P-LAEME	1230	Poetry
HarrowHell	The Harrowing of Hell	PCMEP	1230	Poetry
egblessedt	Orison to the Virgin Mary	P-LAEME	1230	Poetry
WooingLord	The Wooing of the Lord	PCMEP (Suppl.)	1230	Prose
LoveRon	The Love Ron	PCMEP	1235	Poetry
tr323cBV	Nu This Fules	P-LAEME	1235	Poetry
egstellat	Song in Praise of the Virgin Mary	P-LAEME	1235	Poetry
tanner169t	Stabat Iuxta	P-LAEME	1235	Poetry
cotcleoBvimisc	Two Short Poems	P-LAEME	1235	Poetry
AssumpVirg	Assumption of the Virgin	PCMEP	1240	Poetry
trincleoDmisc (part)	Short Verses	P-LAEME	1240	Poetry
trincleoDmisc (part)	Two Short Prose Sermons	P-LAEME	1240	Prose
LittleSerm	A Little True Sermon	PCMEP	1245	Poetry
Maximian	Le Regret de Maximian	PCMEP	1245	Poetry

The Replacement of Subordinating *then* with *when* in Middle English

File Name	Text Name	Corpus	Year	Genre
PassionLord	The Passion of Our Lord	PCMEP	1245	Poetry
digby86doomsday	Doomsday	P-LAEME	1250	Poetry
ElevenPains	Eleven Pains of Hell	PCMEP	1250	Poetry
genexodt	Rhymed Genesis	P-LAEME	1250	Poetry
CMKENTSE	Kentish Sermons	PPCME2	1250	Prose
jeslastday	The Latemest Day	P-LAEME	1250	Poetry
candet5respice	LookToThyLord	P-LAEME	1250	Poetry
bodley26t	A Macaronic Sermon	P-LAEME	1250	Prose
digby86psalter	Our Lady's Psalter	P-LAEME	1250	Poetry
OwlNight	The Owl and the Nightingale	PCMEP	1250	Poetry
emmanuel27misc	Short Verses in Ms. Emmanuel 27	P-LAEME	1250	Poetry
vitelld3t	Floris and Blauncheflur	P-LAEME	1255	Poetry
huntproct	Proclamationof Henry III	P-LAEME	1258	Prose
corp145selt	The South English Legendary	P-LAEME	1260	Poetry
IacoIose	Jacob and Joseph	PCMEP	1265	Poetry
laud108ainfancy	Infancy of Christ	P-LAEME	1265	Poetry
laud108alife	Life of Christ	P-LAEME	1265	Poetry
digby86eustace	Saint Eustace (Digby 86)	P-LAEME	1265	Poetry
royal2f8t	Two Poems in Ms. Royal 2 F8	P-LAEME	1265	Poetry
DameSirith	Dame Sirith	PCMEP	1270	Poetry
lam499lyrics	Eight English Lyrics	P-LAEME	1270	Poetry
digby86bede	Sayings of Bede	P-LAEME	1270	Poetry
ThruNight	The Thrush and the Nightingale	PCMEP	1270	Poetry
digby86ubi	Ubi Sunt	P-LAEME	1270	Poetry
candet3t	Candet Nudatum Pectus	P-LAEME	1275	Poetry
adde6bxvsigns	Fifteen Tokens	P-LAEME	1275	Poetry
FoxWolf	The Fox and the Wolf	PCMEP	1275	Poetry
digby86love	Love is Soft	P-LAEME	1275	Poetry
digby2bt	No More Will I Wicked Be	P-LAEME	1275	Poetry
digby86hendingt	The Proverbs of Hending	P-LAEME	1275	Poetry
adde6at	The Saying of St. Bernard	P-LAEME	1275	Poetry
emmanuel27creed	The Creed	P-LAEME	1275	Prose
arundel248lamb	Milde Lomb	P-LAEME	1280	Poetry
ccco59misc	Two Poems from Ms. CCCC 59	P-LAEME	1280	Poetry
arundel248bliss	Worldes Bliss	P-LAEME	1280	Poetry
digby86hare	Names of the Hare	P-LAEME	1285	Poetry
TreatDreams	A Treatise on Dreams	PCMEP	1285	Poetry
laud108bt	Dispute between Body and Soul	P-LAEME	1290	Poetry
Havelok	Havelok the Dane	PCMEP	1290	Poetry
digby2a2t	Hayl Mary	P-LAEME	1290	Poetry
digby2a1t	Song of the Passion	P-LAEME	1290	Poetry
hale135t	Nou Sprinkes the Sprai	P-LAEME	1295	Poetry
cccc8t	Worldes Blys	P-LAEME	1295	Poetry
Husbandman	Song of the Husbandman	PCMEP	1297	Poetry
Alisaunder	Alexander	PCMEP	1300	Poetry
Cokaygne	Land of Cokaygne	PCMEP	1300	Poetry
edincmat,ct	CursorMundie	P-LAEME	1300	Poetry
dulwicht	Evangelie	P-LAEME	1300	Poetry

File Name	Text Name	Corpus	Year	Genre
arundel248angelus	Gabriel From Heaven	P-LAEME	1300	Poetry
clericot	Interludium Clerico et Puella	P-LAEME	1300	Poetry
Fridesw	Saint Frideswide	PCMEP	1305	Poetry
cotfaustbt	Raising of Lazarus	P-LAEME	1305	Poetry
royal12e1bthink	Think, Man, of My Hard Stundes	P-LAEME	1305	Poetry
cotfaustat	Two Fragments	P-LAEME	1305	Poetry
DavyDreams	Adam Davy's Five Dreams	PCMEP	1310	Poetry
beverleyt	Rhyming Charter	P-LAEME	1310	Poetry
AmisAmiloun	Amis and Amiloun	PCMEP	1315	Poetry
edincmbt	Northern Homily Cycle	P-LAEME	1315	Poetry
Marina	Saint Marina	PCMEP	1320	Poetry
OrisFiveJoys	Orison of the Five Joys	PCMEP	1320	Poetry
ramseyat	Register Ramsey Abbey	P-LAEME	1325	Prose
Simonie	The Simonie	PCMEP	1325	Poetry
scotwart	Ballad Scottish War	P-LAEME	1335	Poetry
CMAYENBI	Ayenbite of Inwyt	PPCME2	1340	Prose
Nicodemus	Gospel of Nicodemus	PCMEP	1340	Poetry
CMROLLEP	Richard Rolle Epistles	PPCME2	1345	Prose
CMROLLTR	Richard Rolle Treatises	PPCME2	1345	Prose
merton248t	Short Verses, Merton 248 (Hand C)	P-LAEME	1345	Poetry
westminstert	A Short Verse	P-LAEME	1350	Poetry
DisMaryCross	Dispute Mary and the Cross	PCMEP	1350	Poetry
CMEARLPS	Earliest Prose Psalter	PPCME2	1350	Prose
aberdeent	Four Short Verses	P-LAEME	1350	Poetry
HowHearMass	How to Hear Mass	PCMEP	1355	Poetry
CMGAYTRY	Dan Jon Gaytryge's Sermon	PPCME2	1357	Prose
CMEDTHOR	Mirror of Edmund (Thornton)	PPCME2	1360	Prose
WynWas	Winner and Waster	PCMEP	1360	Poetry
CMMANDEV	Travels of Sir Mandeville	PPCME2	1371	Prose
CMEDVERN	Mirror of Edmund (Vernon)	PPCME2	1375	Prose
CMAELR3	Rievaulx De Institutione (Vernon)	PPCME2	1375	Prose
CMBOETH	Chaucer's Boethius Translation	PPCME2	1380	Prose
CMNTEST	Wycliffe New Testament	PPCME2	1383	Prose
CMOTEST	Wycliffe Old Testament	PPCME2	1383	Prose
CMWYCSER	Wycliffe Sermons	PPCME2	1383	Prose
Troyus	Troilus and Criseyde	PPCME2 (Suppl.)	1385	Poetry
CMPOLYCH	John Trevisia's Polychronicon	PPCME2	1387	Prose
CMPURVEY	Purvey's Prologue to Wycliffe	PPCME2	1388	Prose
CMJULNOR	Julian of Norwich's Revelations	PPCME2	1390	Prose
SquireTale	Chaucer's Squire's Tale	PPCME2 (Suppl.)	1390	Poetry
CMASTRO	Chaucer's Treatise on the Astrolabe	PPCME2	1391	Prose
CMEQUATO	Equatorie of the Planets	PPCME2	1392	Prose
CMCTPARS	Chaucer's Parson's Tale	PPCME2	1395	Prose
CMCTMELI	Chaucer's Tale of Melibee	PPCME2	1395	Prose
CMCLOUD	Cloud of Unknowing	PPCME2	1395	Prose
SirCleges	Sir Cleges	PCMEP	1395	Poetry
CMHILTON	Hilton's Eight Chapters on Perfection	PPCME2	1396	Prose
BirdFoFe	Bird with Four Feathers	PCMEP	1400	Poetry

File Name	Text Name	Corpus	Year	Genre
CMVICES4	Book of Vices and Virtues	PPCME2	1400	Prose
CMBRUT3	Chronicles of England (Prose Brut)	PPCME2	1400	Prose
LetterCupid	The Letter of Cupid	PCMEP	1402	Poetry
CMTHORN	Liber de Diversis Medicinis	PPCME2	1410	Prose
CMMIRK	Mirk's Festial	PPCME2	1410	Prose
CMBENRUL	Northern Rule St. Benet	PPCME2	1415	Prose
CMROYAL	Sermons from Ms. Royal 18 B	PPCME2	1425	Prose
CMHORSES	Treatise on Horses	PPCME2	1425	Prose
CMAELR4	Rievaulx's De Institutione (Bodley)	PPCME2	1430	Prose
CMKEMPE	Book of Margery Kempe	PPCME2	1435	Prose
CMEDMUND	Life of St. Edmund	PPCME2	1438	Prose
CMCAPSER	Capgrave's Sermon	PPCME2	1452	Prose
CMCAPCHR	Capgrave's Chronicle	PPCME2	1460	Prose
CMGREGOR	Gregory's Chronicle	PPCME2	1467	Prose
CMMALORY	Malory's Morte D'Arthur	PPCME2	1470	Prose
CMREYNES	Reynes' Commonplace Book	PPCME2	1475	Prose
CMREYNAR	Reynard the Fox	PPCME2	1481	Prose
CMFITZJA	Fitzjames' Sermo Die Lune	PPCME2	1495	Prose
CMINNOCE	In Die Innocencium	PPCME2	1497	Prose
CMSIEGE	Siege of Jerusalem	PPCME2	1500	Prose

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