Appendix B. Corpora, observation numbers, and logistic regression estimates

*B.1 MCVF (2010) and Penn Supplement to MCVF (2010)*

The quantitative data used in this paper were extracted from Penn-scheme annotated corpora MCVF (2010) and Penn Supplement to MCVF (2010) using Parsed Corpora Query Language (PCQL) and CorpusSearch software (<http://corpussearch.sourceforge.net/>). The parsing scheme and the query language are thoroughly described in Ingason (2016). Lists of morphological and syntactic tags used specifically in the MCVF can be found at the following locations:

<http://gtrc.voies.uottawa.ca/manuel/manuel-morpho-fr/index.htm> and

<http://gtrc.voies.uottawa.ca/manuel/syntax-manual-fr/index.htm>.

CorpusSearch can code chunks of structure (of any size) for any number of annotation parameters and extract coding strings as datasets. As an example, consider two clauses in (1B) and (3B) with parses in (2B) and (4B) respectively which were coded for the variables *Date*, *Clause type*, *Subject type*, *Subject person*, *Subject position*, *Conjugation type*, *Text form* and *Ending type*.

(1B) de sanct Maxens abbas divint.

 of Saint Maxence abbot became

 ‘(He) became the abbot of Saint Maxence’ (0980-LEGER-V,V.30)

(2B) ( (IP-MAT (CODING-IP-MAT 0980:mat:no:null:na:pre:second:verse:t)

 (NP-PRD (PP (P de)

 (NP-PP (ADJ sanct) (NPRS Maxens)))

(NCS abbas))

 (NP-SBJ \*pro\*)

(VJ divint)  (PONFP .))

(ID 0980-LEGER-V,V.30))

(3B) par le divine volentét, il derables icel

 by the divine will he desired this

 sul filz angendrat.

  his son conceived

  ‘By the divine will, he conceived this much desired son of his.’ (10XX-ALEXIS-V,0.5)

(4B) ( (IP-MAT (CODING-IP-MAT 1050:mat:yes:pron:third:pre:first:verse:at)

 (PP (P par)

  (NP-PP (D le) (ADJ divine) (NCS volent et)))

 (PON ,)

(NP-SBJ (PRO il))

 (ADJP-SPR (ADJ derables))

 (NP-ACC (D icel) (ADJ sul) (NCS filz))

(VJ angendrat)

(PONFP .))

 (ID 10XX-ALEXIS-V,0.5))

These codings can be extracted and treated by a statistical software as a dataset, such as the toy example in Table 1B:

Table 1B. *A corpus-based dataset example*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Date: | Clause: | Subject: | Type: | Person: | Position: | Conjugation: | Form: | Ending |
| 1050: | mat: | yes: | pron: | third: | pre: | first: | verse: | at |
| 0980: | mat: | no: | null: | na: | pre: | second: | verse: | t |

Table 2B gives the available relevant information about corpus texts. In this table, some texts are assigned artificial exact dates for methodological reasons, since the actual date attribution for the manuscripts of the earliest periods is rarely precise and is usually done using a half or a third of a century intervals rather than exact dates. More information about the manuscript editions used in the treebanks can be found at: <http://www.voies.uottawa.ca/corpus_pg_en.html> and <http://www.ling.upenn.edu/~beatrice/corpus-ling/frenchTexts.html>.

Table 2B. *MCVF (2010) and Penn Supplement to MCVF (2010) texts*

|  |  |  |  |
| --- | --- | --- | --- |
| Date | Title | Author | Form |
| 980 | Saint Léger | na | verse |
| 1050 | La vie de Saint Alexis | na | verse |
| 1100 | La chanson de Roland | na | verse |
| 1120 | Le voyage de Saint Brendan | Benedeit | verse |
| 1130 | Leis Willelme | na | prose |
| 1155 | Li quatre livre des reis | na | prose |
| 1177 | Yvain | Chrétien de Troyes | verse |
| 1180 | Les lais | Marie de France | verse |
| 1190 | Joseph d’Arimathe | Robert de Boron | prose |
| 1194 | Chartre de Chievres | na | prose |
| 1200 | Aucassin et Nicollette | na | prose, verse |
| 1205 | La Conquête de Constantinople | Robert de Clari | prose |
| 1212 | La vie de Saint Eustache (ed. J.R. Fischer) | Pierre de Beauvais | verse |
| 1220 | Chronique de (pseudo)Turpin | na | prose |
| 1223 | Sermon sur Sainte-Agnès | na | prose |
| 1224 | La vie de Saint Eustache (ed. H. Petersen) | na | verse |
| 1225 | La Queste del Saint Graal | na | prose |
| 1255 | Saint Eustache (ed. J. Murray) | na | prose |
| 1270 | Cassidorus | na | prose |
| 1275 | Livre Roisin | Jean Roisin | prose |
| 1279 | Somme des vices et des vertus | Frère Laurent | prose |
| 1309 | La vie de Saint Louis | Jean de Joinville | prose |
| 1330 | Roman de Perceforest | na | prose |
| 1370 | Prise d’Alexandrie | Guillaume de Machaut | verse |
| 1373 | Chroniques | Jean de Froissart | prose |
| 1427 | Formulaire de la chancellerie royale | Odart Morchesne | prose |
| 1440 | XV Joyes de marriage | na | prose |
| 1450 | Les Cent Nouvelles Nouvelles | na | prose |
| 1498 | Mémoires | Philippe de Commynes | prose |
| 1523 | Le nouveau testament | transl. Jean Lefèvre d’Etaples | prose |
| 1527 | Histoire du Seigneur de Bayart | na | prose |
| 1572 | Correspondance | Marguerite de Valois | prose |

*B.2 Observations*

Tables 3B−10B give observation numbers we use in our models.

Table 3B. *Overt and null pronominal subjects in main and subordinate clauses (*n *= 76150)*

|  |  |  |
| --- | --- | --- |
|  | Matrix | Subordinate |
| Date  | overt | null | overt | overt | null | overt |
| 980 | 24 | 14 | 0.37 | 40 | 21 | 0.34 |
| 1050 | 111 | 32 | 0.22 | 96 | 60 | 0.38 |
| 1100 | 665 | 220 | 0.25 | 264 | 221 | 0.46 |
| 1120 | 262 | 29 | 0.10 | 291 | 71 | 0.20 |
| 1130 | 6 | 5 | 0.45 | 15 | 98 | 0.87 |
| 1155 | 404 | 172 | 0.30 | 256 | 635 | 0.71 |
| 1177 | 541 | 291 | 0.35 | 487 | 1119 | 0.70 |
| 1180 | 920 | 315 | 0.26 | 395 | 634 | 0.62 |
| 1190 | 420 | 338 | 0.45 | 431 | 1359 | 0.76 |
| 1194 | 2 | 0 | 0 | 4 | 40 | 0.91 |
| 1200 | 116 | 174 | 0.60 | 44 | 291 | 0.87 |
| 1205 | 212 | 174 | 0.45 | 42 | 1114 | 0.96 |
| 1212 | 176 | 67 | 0.28 | 161 | 176 | 0.52 |
| 1220 | 144 | 102 | 0.41 | 122 | 415 | 0.77 |
| 1223 | 12 | 79 | 0.87 | 4 | 166 | 0.98 |
| 1224 | 165 | 46 | 0.22 | 218 | 227 | 0.51 |
| 1225 | 94 | 347 | 0.79 | 76 | 1477 | 0.95 |
| 1255 | 34 | 101 | 0.75 | 10 | 215 | 0.96 |
| 1270 | 503 | 804 | 0.62 | 290 | 2105 | 0.88 |
| 1275 | 7 | 11 | 0.61 | 23 | 152 | 0.87 |
| 1279 | 68 | 141 | 0.67 | 49 | 732 | 0.94 |
| 1309 | 196 | 753 | 0.79 | 90 | 2935 | 0.97 |
| 1330 | 175 | 481 | 0.73 | 133 | 1307 | 0.91 |
| 1370 | 468 | 303 | 0.39 | 505 | 1163 | 0.70 |
| 1373 | 366 | 1455 | 0.80 | 339 | 4143 | 0.92 |
| 1427 | 23 | 17 | 0.42 | 55 | 248 | 0.82 |
| 1440 | 103 | 639 | 0.86 | 95 | 1392 | 0.94 |
| 1450 | 384 | 2573 | 0.87 | 877 | 5028 | 0.85 |
| 1498 | 111 | 248 | 0.69 | 126 | 993 | 0.89 |
| 1523 | 14 | 698 | 0.98 | 76 | 855 | 0.92 |
| 1527 | 168 | 538 | 0.76 | 340 | 1373 | 0.80 |
| 1572 | 1 | 501 | 1 | 157 | 1176 | 0.88 |

Table 4B. *Overt and null personal and expletive subjects (*n *= 76150)*

|  |  |  |
| --- | --- | --- |
|  | Personal | Expletive |
| Date | null | overt | overt | null | overt | overt |
| 980 | 60 | 35 | 0.37 | 4 | 0 | 0 |
| 1050 | 175 | 91 | 0.34 | 32 | 1 | 0.03 |
| 1100 | 767 | 426 | 0.36 | 162 | 15 | 0.08 |
| 1120 | 457 | 98 | 0.18 | 96 | 2 | 0.02 |
| 1130 | 18 | 101 | 0.85 | 3 | 2 | 0.40 |
| 1155 | 568 | 800 | 0.58 | 92 | 7 | 0.07 |
| 1177 | 842 | 1321 | 0.61 | 186 | 89 | 0.32 |
| 1180 | 1043 | 931 | 0.47 | 272 | 18 | 0.06 |
| 1190 | 726 | 1647 | 0.69 | 125 | 50 | 0.29 |
| 1194 | 5 | 37 | 0.88 | 1 | 3 | 0.75 |
| 1200 | 123 | 449 | 0.78 | 37 | 16 | 0.30 |
| 1205 | 200 | 1216 | 0.86 | 54 | 72 | 0.57 |
| 1212 | 284 | 234 | 0.45 | 53 | 9 | 0.15 |
| 1220 | 192 | 501 | 0.72 | 74 | 16 | 0.18 |
| 1223 | 14 | 244 | 0.95 | 2 | 1 | 0.33 |
| 1224 | 344 | 264 | 0.43 | 39 | 9 | 0.19 |
| 1225 | 107 | 1711 | 0.94 | 63 | 113 | 0.64 |
| 1255 | 25 | 304 | 0.92 | 19 | 12 | 0.39 |
| 1270 | 508 | 2647 | 0.84 | 285 | 262 | 0.48 |
| 1275 | 2 | 147 | 0.99 | 28 | 16 | 0.36 |
| 1279 | 78 | 818 | 0.91 | 39 | 55 | 0.59 |
| 1309 | 167 | 3438 | 0.95 | 119 | 250 | 0.68 |
| 1330 | 213 | 1628 | 0.88 | 95 | 160 | 0.63 |
| 1370 | 788 | 1323 | 0.63 | 185 | 143 | 0.44 |
| 1373 | 358 | 5221 | 0.94 | 347 | 377 | 0.52 |
| 1427 | 44 | 220 | 0.83 | 34 | 45 | 0.57 |
| 1440 | 87 | 1839 | 0.95 | 111 | 192 | 0.63 |
| 1450 | 831 | 6930 | 0.89 | 430 | 671 | 0.61 |
| 1498 | 123 | 1055 | 0.90 | 114 | 186 | 0.62 |
| 1523 | 64 | 1481 | 0.96 | 26 | 72 | 0.73 |
| 1527 | 366 | 1644 | 0.82 | 142 | 267 | 0.65 |
| 1572 | 143 | 1517 | 0.91 | 15 | 160 | 0.91 |

Table 5B. *Ending variation in Group I present indicative and subjunctive 1st sg & 3rd sg subject*

|  |  |  |
| --- | --- | --- |
|  | Group I present indicative and subjunctive & 1st sg | Ending variation in Group I present indicative and subjunctive & 3rd sg |
| Date | zero | -e | -e | -t | -e | -e |
| 980 | 0 | 0 | na | 2 | 1 | 0.33 |
| 1050 | 0 | 0 | na | 19 | 0 | 0 |
| 1100 | 13 | 3 | 0.19 | 160 | 3 | 0.02 |
| 1120 | 3 | 3 | 0.50 | 25 | 8 | 0.24 |
| 1130 | 0 | 0 | na | 9 | 11 | 0.55 |
| 1155 | 6 | 10 | 0.62 | 24 | 29 | 0.55 |
| 1177 | 43 | 3 | 0.07 | 29 | 191 | 0.87 |
| 1180 | 19 | 1 | 0.05 | 7 | 47 | 0.87 |
| 1190 | 13 | 8 | 0.38 | 5 | 59 | 0.92 |
| 1194 | 0 | 0 | na | 0 | 1 | 1 |
| 1200 | 17 | 4 | 0.19 | 0 | 29 | 1 |
| 1205 | 6 | 5 | 0.45 | 0 | 16 | 1 |
| 1212 | 2 | 0 | 0 | 1 | 17 | 0.94 |
| 1220 | 9 | 3 | 0.25 | 25 | 10 | 0.29 |
| 1223 | 2 | 0 | 0 | 7 | 21 | 0.75 |
| 1224 | 3 | 0 | 0 | 0 | 21 | 1 |
| 1225 | 24 | 0 | 0 | 6 | 204 | 0.97 |
| 1255 | 4 | 0 | 0 | 0 | 1 | 1 |
| 1270 | 17 | 26 | 0.60 | 5 | 64 | 0.93 |
| 1275 | 0 | 0 | na | 0 | 15 | 1 |
| 1279 | 1 | 5 | 0.83 | 1 | 266 | 1 |
| 1309 | 12 | 51 | 0.81 | 4 | 92 | 0.96 |
| 1330 | 7 | 40 | 0.85 | 9 | 116 | 0.93 |
| 1370 | 21 | 37 | 0.64 | 17 | 193 | 0.92 |
| 1373 | 7 | 69 | 0.91 | 1 | 134 | 0.99 |
| 1427 | 0 | 0 | na | 3 | 45 | 0.94 |
| 1440 | 12 | 53 | 0.82 | 3 | 248 | 0.99 |
| 1450 | 11 | 244 | 0.96 | 16 | 285 | 0.95 |
| 1498 | 0 | 16 | 1 | 0 | 25 | 1 |
| 1523 | 0 | 51 | 1 | 0 | 74 | 1 |
| 1527 | 0 | 68 | 1 | 4 | 48 | 0.92 |
| 1572 |  1 | 267 | 1  | 1 | 101 | 0.99 |

Table 6B. *Ending variation in Group II imperfect and present subjunctive & 3rd sg subject and Ending variation in Group I preterite and future & 3rd sg subject*

|  |  |  |
| --- | --- | --- |
|  | Group II imperfect and present subjunctive & 3rd sg | Group I preterite and future & 3rd sg |
|  Date | -et | -e | -e | -at | -a | -a |
| 980 | 1 | 0 | 0 | 10 | 1 | 0.09 |
| 1050 | 4 | 0 | 0 | 9 | 0 | 0 |
| 1100 | 22 | 8 | 0.27 | 42 | 0 | 0 |
| 1120 | 4 | 0 | 0 | 14 | 0 | 0 |
| 1130 | 5 | 17 | 0.77 | 9 | 2 | 0.18 |
| 1155 | 10 | 37 | 0.79 | 397 | 37 | 0.09 |
| 1177 | 0 | 74 | 1 | 0 | 90 | 1 |
| 1180 | 2 | 24 | 0.92 | 26 | 111 | 0.81 |
| 1190 | 0 | 38 | 1 | 0 | 187 | 1 |
| 1194 | 0 | 1 | 1 | 0 | 2 | 1 |
| 1200 | 0 | 5 | 1 | 0 | 40 | 1 |
| 1205 | 1 | 6 | 0.86 | 0 | 165 | 1 |
| 1212 | 0 | 8 | 1 | 0 | 35 | 1 |
| 1220 | 29 | 3 | 0.09 | 0 | 204 | 1 |
| 1223 | 2 | 1 | 0.33 | 4 | 12 | 0.75 |
| 1224 | 2 | 15 | 0.88 | 0 | 25 | 1 |
| 1225 | 0 | 48 | 1 | 0 | 169 | 1 |
| 1255 | 0 | 4 | 1 | 0 | 46 | 1 |
| 1270 | 0 | 31 | 1 | 1 | 209 | 1 |
| 1275 | 0 | 12 | 1 | 0 | 4 | 1 |
| 1279 | 1 | 27 | 0.96 | 0 | 9 | 1 |
| 1309 | 0 | 62 | 1 | 4 | 477 | 0.99 |
| 1330 | 0 | 16 | 1 | 0 | 359 | 1 |
| 1370 | 3 | 79 | 0.96 | 0 | 201 | 1 |
| 1373 | 2 | 28 | 0.93 | 0 | 833 | 1 |
| 1427 | 0 | 14 | 1 | 0 | 1 | 1 |
| 1440 | 1 | 61 | 0.98 | 0 | 70 | 1 |
| 1450 | 1 | 94 | 0.99 | 0 | 868 | 1 |
| 1498 | 0 | 7 | 1 | 0 | 200 | 1 |
| 1523 | 0 | 14 | 1 | 0 | 155 | 1 |
| 1527 | 0 | 21 | 1 | 1 | 361 | 1 |
| 1572 | 0 | 47 | 1 | 4 | 40 | 0.91 |

Table 7B. *Ending variation in Group II future & 3rd sg subject and Ending variation in Group II preterite & 3rd sg subject*

|  |  |  |
| --- | --- | --- |
|  | Group II future & 3rd sg | Group II preterite & 3rd sg |
|  Date | -at | -a | -a | -t | zero | zero |
| 980 | 3 | 5 | 0.62 | 8 | 6 | 0.43 |
| 1050 | 0 | 0 | na | 6 | 0 | 0 |
| 1100 | 31 | 0 | 0 | 54 | 1 | 0.02 |
| 1120 | 11 | 0 | 0 | 34 | 1 | 0.03 |
| 1130 | 6 | 3 | 0.33 | 3 | 1 | 0.25 |
| 1155 | 62 | 2 | 0.03 | 123 | 221 | 0.64 |
| 1177 | 2 | 58 | 0.97 | 73 | 38 | 0.34 |
| 1180 | 13 | 24 | 0.65 | 55 | 81 | 0.60 |
| 1190 | 0 | 164 | 1 | 46 | 80 | 0.63 |
| 1194 | 0 | 0 | na | 0 | 0 | na |
| 1200 | 1 | 10 | 0.91 | 22 | 26 | 0.54 |
| 1205 | 1 | 45 | 0.98 | 99 | 82 | 0.45 |
| 1212 | 0 | 9 | 1 | 17 | 16 | 0.48 |
| 1220 | 0 | 55 | 1 | 136 | 77 | 0.36 |
| 1223 | 0 | 4 | 1 | 7 | 11 | 0.61 |
| 1224 | 0 | 6 | 1 | 26 | 18 | 0.41 |
| 1225 | 1 | 59 | 0.98 | 69 | 48 | 0.41 |
| 1255 | 0 | 6 | 1 | 18 | 24 | 0.57 |
| 1270 | 0 | 43 | 1 | 134 | 80 | 0.37 |
| 1275 | 0 | 11 | 1 | 1 | 0 | 0 |
| 1279 | 1 | 11 | 0.92 | 99 | 11 | 0.10 |
| 1309 | 2 | 46 | 0.96 | 314 | 170 | 0.35 |
| 1330 | 3 | 88 | 0.97 | 68 | 130 | 0.66 |
| 1370 | 6 | 68 | 0.92 | 84 | 75 | 0.47 |
| 1373 | 1 | 86 | 0.99 | 93 | 350 | 0.79 |
| 1427 | 0 | 3 | 1 | 20 | 1 | 0.05 |
| 1440 | 2 | 113 | 0.98 | 129 | 0 | 0 |
| 1450 | 1 | 196 | 0.99 | 1161 | 6 | 0.01 |
| 1498 | 1 | 25 | 0.96 | 71 | 0 | 0 |
| 1523 | 0 | 48 | 1 | 237 | 0 | 0 |
| 1527 | 0 | 65 | 1 | 167 | 0 | 0 |
| 1572 | 1 | 53 | 0.98 | 50 | 1 | 0.02 |

Table 8B. *Ending variation in Group II present indicative and preterite & 1st sg subject and Ending variation in Group I imperfect and future conditional & 1st sg subject*

|  |  |  |
| --- | --- | --- |
|  | Group II present indicative and preterite & 1st sg subject | Group I imperfect and future conditional & 1st sg subject |
|  Date | zero | -s | -s | zero | -s | -s |
| 980 | 0 | 0 | na | 0 | 0 | na |
| 1050 | 2 | 0 | 0 | 0 | 0 | na |
| 1100 | 22 | 23 | 0.51 | 0 | 0 | na |
| 1120 | 2 | 1 | 0.33 | 1 | 0 | 0 |
| 1130 | 0 | 0 | na | 0 | 0 | na |
| 1155 | 21 | 18 | 0.46 | 3 | 0 | 0 |
| 1177 | 94 | 37 | 0.28 | 7 | 0 | 0 |
| 1180 | 49 | 12 | 0.20 | 3 | 0 | 0 |
| 1190 | 73 | 39 | 0.35 | 14 | 0 | 0 |
| 1194 | 0 | 0 | na | 0 | 0 | na |
| 1200 | 21 | 8 | 0.28 | 8 | 0 | 0 |
| 1205 | 3 | 1 | 0.25 | 8 | 0 | 0 |
| 1212 | 15 | 1 | 0.06 | 1 | 0 | 0 |
| 1220 | 16 | 10 | 0.38 | 1 | 0 | 0 |
| 1223 | 2 | 1 | 0.33 | 0 | 0 | na |
| 1224 | 19 | 2 | 0.10 | 0 | 0 | na |
| 1225 | 75 | 11 | 0.13 | 6 | 0 | 0 |
| 1255 | 17 | 9 | 0.35 | 0 | 0 | na |
| 1270 | 186 | 57 | 0.23 | 14 | 0 | 0 |
| 1275 | 2 | 0 | 0 | 0 | 0 | na |
| 1279 | 16 | 0 | 0 | 1 | 0 | 0 |
| 1309 | 160 | 161 | 0.50 | 39 | 0 | 0 |
| 1330 | 63 | 36 | 0.36 | 8 | 0 | 0 |
| 1370 | 85 | 20 | 0.19 | 8 | 0 | 0 |
| 1373 | 102 | 20 | 0.16 | 17 | 0 | 0 |
| 1427 | 1 | 0 | 0 | 0 | 0 | na |
| 1440 | 100 | 34 | 0.25 | 14 | 0 | 0 |
| 1450 | 313 | 174 | 0.36 | 39 | 0 | 0 |
| 1498 | 30 | 26 | 0.46 | 1 | 1 | 0.50 |
| 1523 | 22 | 99 | 0.82 | 1 | 0 | 0 |
| 1527 | 46 | 52 | 0.53 | 2 | 6 | 0.75 |
| 157 | 5 | 10 | 0.6 |  0 | 22 |  1 |

Table 9B. *Ending variation in Group II imperfect and future conditional & 1st sg subject and Ending variation in Group I present indicative and subjunctive & 1st sg null subject*

|  |  |  |
| --- | --- | --- |
|  | Group II imperfect and future conditional & 1st sg | Group I present indicative and subjunctive & 1st sg null subject |
|  Date | zero | -s | -s | zero | -e | -e |
| 980 | 0 | 0 | na | 1 | 0 | 0 |
| 1050 | 2 | 0 | 0 | 1 | 1 | 0.50 |
| 1100 | 5 | 1 | 0.17 | 18 | 2 | 0.10 |
| 1120 | 1 | 0 | 0 | 2 | 2 | 0.50 |
| 1130 | 0 | 0 | na | 0 | 0 | na |
| 1155 | 2 | 2 | 0.50 | 3 | 1 | 0.25 |
| 1177 | 22 | 0 | 0 | 24 | 1 | 0.04 |
| 1180 | 5 | 1 | 0.17 | 45 | 0 | 0 |
| 1190 | 21 | 0 | 0 | 8 | 2 | 0.20 |
| 1194 | 0 | 0 | na | 0 | 0 | na |
| 1200 | 6 | 0 | 0 | 0 | 0 | na |
| 1205 | 3 | 0 | 0 | 0 | 0 | na |
| 1212 | 0 | 0 | na | 3 | 0 | 0 |
| 1220 | 1 | 0 | 0 | 1 | 0 | 0 |
| 1223 | 0 | 0 | na | 0 | 0 | na |
| 1224 | 0 | 0 | na | 3 | 1 | 0.25 |
| 1225 | 38 | 0 | 0 | 3 | 1 | 0.25 |
| 1255 | 2 | 0 | 0 | 3 | 0 | 0 |
| 1270 | 52 | 0 | 0 | 4 | 0 | 0 |
| 1275 | 0 | 0 | na | 0 | 0 | na |
| 1279 | 0 | 0 | na | 0 | 0 | na |
| 1309 | 93 | 0 | 0 | 4 | 1 | 0.20 |
| 1330 | 19 | 0 | 0 | 1 | 6 | 0.86 |
| 1370 | 18 | 0 | 0 | 6 | 12 | 0.67 |
| 1373 | 19 | 0 | 0 | 4 | 0 | 0 |
| 1427 | 0 | 0 | na | 0 | 0 | 0 |
| 1440 | 34 | 0 | 0 | 1 | 2 | 0.67 |
| 1450 | 69 | 3 | 0.04 | 1 | 26 | 0.96 |
| 1498 | 7 | 0 | 0 | 0 | 1 | 1 |
| 1523 | 4 | 1 | 0.20 | 0 | 0 | na |
| 1527 | 11 | 13 | 0.54 | 1 | 10 | 0.91 |
| 1572 | 0  | 41 |  1 |  0 |  3 |  1 |

Table 10B. Ending ambiguity counts (conservative)

|  |  |  |  |
| --- | --- | --- | --- |
|  Date | no | yes | yes |
| 980 | 173 | 8 | 0.04 |
| 1050 | 483 | 14 | 0.03 |
| 1100 | 2555 | 115 | 0.04 |
| 1120 | 1086 | 68 | 0.06 |
| 1130 | 174 | 39 | 0.18 |
| 1155 | 3704 | 477 | 0.11 |
| 1177 | 3243 | 798 | 0.20 |
| 1180 | 2711 | 394 | 0.13 |
| 1190 | 3701 | 380 | 0.09 |
| 1194 | 70 | 2 | 0.03 |
| 1200 | 853 | 159 | 0.16 |
| 1205 | 2830 | 123 | 0.04 |
| 1212 | 721 | 109 | 0.13 |
| 1220 | 2140 | 70 | 0.03 |
| 1223 | 306 | 50 | 0.14 |
| 1224 | 756 | 145 | 0.16 |
| 1225 | 2936 | 600 | 0.17 |
| 1255 | 539 | 67 | 0.11 |
| 1270 | 4333 | 483 | 0.10 |
| 1275 | 235 | 36 | 0.13 |
| 1279 | 1206 | 412 | 0.25 |
| 1309 | 5941 | 742 | 0.11 |
| 1330 | 3621 | 393 | 0.10 |
| 1370 | 3411 | 647 | 0.16 |
| 1373 | 13399 | 846 | 0.06 |
| 1427 | 321 | 85 | 0.21 |
| 1440 | 2265 | 624 | 0.22 |
| 1450 | 10547 | 1232 | 0.10 |
| 1498 | 2276 | 112 | 0.05 |
| 1523 | 2313 | 358 | 0.13 |
| 1527 | 3292 | 276 | 0.08 |

*B.3 Logistic regression estimates*

In Tables 11B−13B we present estimates of the parameters of the logistic regression models we built.

Table 11B. *Regression estimates for the emergence of the new endings (The observation numbers underlying these models are given in Tables 3B–9B)*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model\* | Coefficient | Std. Error | z value | Pr(>|z|) |
| e, Group I, 1st | 0.0153 | 0.0009 | 16.77 | < 2 × 10−16 |
| e, Group I, 3rd | 0.0160 | 0.0008 | 18.81 | < 2 × 10−16 |
| e, Group II, 3rd | 0.0144 | 0.0017 | 8.32 | < 2 × 10−16 |
| a, Group I, 3rd | 0.0752 | 0.0037 | 20.10 | < 2 × 10−16 |
| a, Group II, 3rd | 0.0199 | 0.0019 | 10.46 | < 2 × 10−16 |
| zero, Group II | 0.0030 | 0.0004 | 6.63 | < 2 × 10−16 |
| s, Group II, 1st | 0.0030 | 0.0003 | 9.05 | < 2 × 10−16 |
| s, Group I, 1st, imperf. & fut. cond. | undefined |  |  |  |
| s, Group II, 1st, imperf. & fut. cond. | 0.0255 | 0.0030 | 8.42 | < 2 × 10−16 |

For the alternation between zero and -s with Group I 1st person imperfect and future conditional, we observe that the date is a perfect predictor for endings. In such situations, one cannot reliably estimate the parameters of a logistic model.

Table 12B. *Regression estimates for the emergence of the new endings with null and overt subjects*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | Estimate | Std. Error | z value | Pr(>|z|) |
| Null 1st sg subject | 0.0146 | 0.0018 | 8.05 | < 2 × 10−16 |
| Overt 1st sg subject | 0.0153 | 0.0009 | 16.77 | < 2 × 10−16 |

Table 13B. *Logistic regression estimates for ambiguous and non-ambiguous endings*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | Coefficient | Std. Error | z value | Pr(>|z|) | Ambiguity |
| e, Group I | 0.0091 | 0.0006 | 14.39 | < 2 × 10−16 | yes |
| e, Group II | 0.0051 | 0.0008 | 6.69 | 2.17 × 10−11 | yes |
| t, Group I | 0.0222 | 0.0059 | 3.75 | 0.0002 | no |
| t, Group II | 0.0048 | 0.0003 | 16.02 | < 2 × 10−16 | no |
| s, Group II | 0.0089 | 0.0008 | 10.55 | < 2 × 10−16 | yes |
| zero, Group I | 0.0100 | 0.0020 | 5.08 | 3.77 × 10−7 | no |
| zero, Group II | 0.0082 | 0.0006 | 14.72 | < 2 × 10−16 | no |