

Not arbitrary, not regular: The magic of gender assignment

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1. Introduction

In this paper we would like to report on a study of gender assignment of English loanwords borrowed into Danish, Swedish and Norwegian.¹ Gender in the Scandinavian languages has proved to be a lively area of research, which is demonstrated by a range of recent publications.² Several important questions remain to be answered: most importantly, to what degree gender assignment can in these languages be regarded as regular. If it is regular, then we would like to know what formal and semantic features of the nouns are relevant in gender assignment, and how important they are with regard to one another. We want to suggest that given proper analytical tools gender assignment, while not completely regular, can to a large degree be attributed to individual criteria. Therefore we would like to validate statistically the contribution of these criteria, and measure their relative importance in the three languages.

We begin with a brief description of the gender systems in the analysed languages and of the postulated gender assignment criteria. This is followed by an overview of the corpus of English loanwords and the types of analysis used in the study. The paper concludes with a discussion of the results for the three languages.

2. Gender in English and Scandinavian

English appears to be an ideal candidate as the lending language as it lacks grammatical gender; in addition, it continues to be a rich source of borrowed lexicon. The choice of the borrowing languages was motivated by the presence of subtle differences between these typologically and genetically close languages. Danish and Swedish share a two-gender system of neuter gender and common gender formed through a merger of masculine and feminine.³ Norwegian presents a more complex case as it may be treated as a two- or a three-gender system, depending on dialectal, struc-

tural and stylistic considerations. In Norwegian Bokmål, feminine gender enjoys an unstable position, which is demonstrated by the small number of nouns with obligatory feminine forms and a weak status of feminine agreement.⁴

3. Gender assignment criteria

In line with previous studies, two broad types of criteria were postulated as significant in the assignment of gender: semantic and formal, where among the latter we further distinguish between phonological and morphological criteria. Semantic rules include four semantic criteria: personal, non-personal animate, abstract and concrete, as well as associations between loanwords and synonymous native nouns. The principle of animacy, according to which animate nouns are assigned to a non-neuter gender, reflects what Greenberg (1966), Aksenov (1984) and Corbett (1991) have referred to as the semantic basis or core of gender. Phonological rules involve the number of syllables, CV structure, selected final sequences of segments, and finally associations with native homophones. And lastly, we deal with four types of morphological assignment rules: inflectional, based on plural declension,⁵ derivational, based on suffixation (here 32 suffixes were analysed) and the derivation of deverbal nouns of the type *run* and *take-off*, and finally compounding.

4. Description of the corpus

The study is based on 3,796 English nouns, borrowed into the three languages in the following numbers: 2,728 in Danish, 2,037 in Swedish and 2,527 nouns in Norwegian. The corpus includes nouns borrowed from or through English; in vast majority these are words borrowed in the post-war period. A few early loans from the Old English period have been excluded due to a different structure of all the languages involved. As regards types of loanwords, the only type included are direct loans, and so excluded are hybrids, calques and semantic loans. The nouns were checked against a selection of six monolingual dictionaries and dictionaries of anglicisms.⁶

5. Analysis

Two types of analysis have been applied. In the first place, a quantitative analysis was applied to account for the share of individual genders within the three languages, and to measure the contribution of individual assignment rules within the genders. Secondly, a discriminant function analysis made it possible to build a model that allowed us to classify loanwords with respect to their gender assuming the postulated criteria. Further, this procedure was used to determine the relative contribution of the criteria to the assignment of gender to loanwords. Discriminant function analysis is one of the extensions of Multivariate Analysis of Variance – a test for significant differences between the means of several groups. In the variant we applied, discriminant function analysis consists in a linear delimitation of the spaces constituted by the features of the classified loanwords. In the course of the analysis, the coefficients of the functions defining these spaces are adjusted to minimize the misclassification rate of new occurrences.

6. Discriminant analysis – predictor variables and levels of grouping variable

In our study, we postulated that 19 factors might influence the assignment of gender to a word borrowed from English into any of the three Scandinavian languages. These 19 factors constituted a grammatical specification of each loanword. This specification was used in the analysis as a set of independent variables on the basis of which each loanword was classified with respect to the gender it assumed in one of the target languages.

In our study, the set of potentially significant independent variables was the same for each of the languages we considered (see Table 1). Nevertheless, some of these variables, different in each language, had to be eliminated in the course of the analysis for technical reasons (see section 6.2.1).

The dependent (grouping) variable was one and the same for each language: the gender of a noun borrowed from English into that language. The values it assumed for Norwegian, however, were different than the values it assumed for Danish and Swedish as we distinguish three genders in Norwegian in contrast with two genders in Danish and Swedish.

Table 1. Predictor variables

Variable classification	Variable name	Question asked to find values of the variable	Admissible answers in decreasing order of frequency
Phonological	POLYSYLLABICITY	Is the noun polysyllabic?	yes, no
	PENULTIMATE PHONEME LENGTH	Is the penultimate phoneme long?	no, yes
	LAST PHONEME LENGTH	Is the last phoneme long?	no, yes
	NUMBER OF FINAL CONSONANTS	How many consonants are there word-finally?	1, 0, 2, 3, 4
	FINAL GLOTTAL STOP IN DANISH	Does the Danish noun end in a glottal stop?	no, yes
Formal	DEVERBAL NOUN WITH A PARTICLE	Is the borrowed noun a deverbal noun with a particle, e.g., <i>take-off</i> ?	no, yes
	DEVERBAL MONOSYLLABLE	Is the noun a deverbal monosyllable, e.g., <i>run</i> ?	no, yes
	SUFFIX	What derivational suffix does the noun contain?	0, -er, -ing, -ie, -ion, -ism, -ist, -an, -ine, -al, -ette, -ance, -man, -ment, -ics, -ery, -ity, -ness, -um, -eme, -age, -ure, -ant, -ate, -ive, -phone, -logy, -ship, -us, -ade, -scope, -graph, -graphy
	PLURAL	What plural form does the noun build?	unassigned, -er, -s, 0, -e, -ar, -r, -or, -n, -men, -män, -es, -a, -menn, -im
	BASE GENDER	Assuming the noun is a compound, what is the gender of its base?	NO GENDER, common, masculine, neuter, common OR neuter, masculine OR feminine

Semantic	PERSONAL	Does the noun belong to the semantic category of PERSONAL?	no, yes
	NON-PERSONAL ANIMATE	Does the noun belong to the semantic category of NON-PERSONAL ANIMATE?	no, yes
	CONCRETE	Does the noun belong to the semantic category of CONCRETE?	yes, no
	ABSTRACT	Does the noun belong to the semantic category of ABSTRACT?	yes, no
	Influence of native equivalent	What is the gender of the native equivalent of the noun in the form of a homonym or synonym?	NO GENDER, common, neutral, masculine, feminine

7. Methodological aspects of the study

7.1. Assumptions behind the discriminant function analysis

Before discriminant analysis can be employed certain assumptions about the variables have to be met. Technically speaking, in order for the Discriminant Analysis to be performed, the data must comply with the following requirements (Chatfield and Collins 1980: 125ff.; Krzyśko 1982: 9):

- a) The number of classes (groups) distinguished in the analysis must be at least 2. In the case of the present study, for Danish and Swedish we distinguish 3 classes (“no gender”, “common” and “neuter”) and for Norwegian we distinguish 4 classes (“no gender”, “feminine”, “masculine” and “neuter”).

- b) Each class must be represented by at least 2 cases. In our case each class is represented by 5066 cases in Danish, 4732 cases in Swedish and 3704 cases in Norwegian.
- c) The number of distinct variables must be less than the total number of cases minus the number of groups. For Danish maximally 11 distinct variables were accepted in the model, for Swedish 12, and for Norwegian 7. In all cases the number of variables is much smaller than the total number of cases minus the number of groups.

Among the assumptions of discriminant analysis there is also a requirement that the classes must have a multivariate-normal distribution and that the within-group variabilities (expressed as within-group correlation matrices) must be approximately equal. The non-categorical variables on which this study was based showed minor violations in the normal distribution (especially the number of syllables in a noun). It has been assumed, however, that minor violations of normality requirement are not fatal to the results of the analysis, as is commonly agreed upon among statisticians. No significant violation of homogeneity of covariances was observed.

Another assumption of discriminant function analysis is that the variables that are used to discriminate between groups are not completely redundant. As part of the computations involved in discriminant analysis, the variance/covariance matrix of the variables included in the model are inverted, which requires that no variable in the matrix is completely redundant with any other variable. In our study, this problem made it impossible to include, e.g., the variables ABSTRACT and CONCRETE together with the INANIMATE variable since the latter variable was just a sum of both ABSTRACT and CONCRETE variables.

A final assumption of the discriminant function analysis is that the means for variables across groups are not correlated with the variances (or standard deviations). To guard against this problem we inspected the means and standard deviations and variances for such a correlation removing any outliers in non-categorical variables.

7.2. Nominal case classification instead of noun classification

In order to classify nouns borrowed from English into the Scandinavian languages with respect to criteria that may have alternative forms for a single noun (e.g., the English noun *baby* when borrowed into Swedish may take three plural endings: *-ar*, *-er* and *-s*), the number of cases submitted to

classification had to be greater than the number of the nouns themselves. A noun with several alternative forms at a given field of its grammatical specification had to be instantiated by a corresponding number of cases. Each case of the same noun had the same specification as its counterparts, except those elements of the specification that included alternative forms. If the given noun contained yet another element of the specification that had several alternative forms (e.g., variant pronunciations for *baby*), the total number of cases was a product of the number of alternative forms at the first field of specification and the number of alternative forms at the second field of specification. If the noun contained any more alternative fields in its grammatical specification, the procedure of multiplying cases was iterated until all alternative fields were considered. Thus, the classification we conducted was not so much a classification of the borrowings themselves. It was rather a classification of grammatical configurations these borrowings occurred in.

8. Results of the quantitative analysis

A general result of the study is that common gender in Danish and Swedish and masculine gender in Norwegian are overrepresented in comparison with the native lexicon (see Table 2).⁷

Table 2. Distribution of nouns in the corpus, in comparison with the native lexicon

		common	neuter	
Danish	loan	85.3	14.7	
	native	75	25	
Swedish	loan	90.4	9.6	
	native	75	25	
		masculine	feminine	neuter
Norwegian	loan	91.1	0	8.9
	native	65	24	11

The data for Danish and Swedish show a marked increase in the percentage of common nouns (85.3% and 90.4% vs. 75%), together with a decrease among neuter nouns (14.7% and 9.6% vs. 25%).⁸ In Norwegian 91.1% of single-gender nouns appear as masculine, as opposed to only 8.9% for neuter nouns. Importantly, there are no feminine-only nouns, and

11 nouns vacillate between masculine and feminine. While a comparison with the native lexicon is here difficult on account of the instability of feminine gender, the tendency away from the feminine and neuter is clear. The expansion of common and masculine genders is confirmed by the results of the discriminant function analysis.

9. Results of discriminant function analysis

As we have already mentioned, discriminant analysis has two major applications: to include many potentially significant predictor variables in order to determine what is the relative discriminating power and to predict a correct classification of cases after a discriminant function model has been built. In our study, discriminant function analysis was applied, firstly, to find out what is the relative importance of different criteria in the assignment of gender to nouns borrowed from English into the three Scandinavian languages and, secondly, to check to what degree the grammatical specification of these borrowings determines their gender in the target languages.

9.1. Classification results

Once the discriminant function model has been built, we may show how well we can predict to which gender group a particular case belongs. The fact that many variables were rejected in the classification was caused by their violation of at least one of the assumptions of discriminant analysis (see section 6.2.1 above). The *post-hoc* classification results we obtained for each language are given below in Table 3.

Table 3. Results of discriminant analysis classification for Danish, Swedish and Norwegian⁹

percentage of correctly classified cases	common	neuter	unassigned	total	
Danish	95.34556	19.46524	13.82253	71.91077	
Swedish	98.4953	2.719665	3.195489	67.39222	
	masculine	feminine	neuter	unassigned	total
Norwegian	97.08	0	0	11.82635	67.65659

The overall percentage of correctly classified cases ranges from 67.4% in Swedish and 67.6% in Norwegian to 71.9% in Danish. It has to be admitted that this result is rather modest and suggests that we are only dealing with a certain degree of regularity in gender assignment in the analysed languages. As regards the individual genders, the model classifies common and masculine cases more successfully than neuter and feminine ones – compare the figures for Danish, with 95.3% for common as opposed to 19.5% for neuter gender. The results for common gender in Swedish and masculine in Norwegian are 98.5% and 97.1% respectively, compared with only 2.7% and 0% for neuter gender. Interestingly, no feminine and neuter cases in Norwegian have been classified correctly; these nouns are instead grouped in the model together with masculine nouns. It appears then that there are only a few or no features at all which positively characterize neuter and feminine genders.¹⁰

9.2. Relative discriminatory power of predictor variables based on a forward stepwise discriminant function analysis

In forward stepwise discriminant analysis, a model of classification proceeds step-by-step. At each step all the variables still not in the model are evaluated to determine which one has the greatest discriminating power. The variable with the greatest discriminating power is then included in the model and the analysis is iterated until all the variables are considered. The results for the three languages are shown below in Tables 4–6.

Plural inflection was shown to have the greatest discriminant power, with a comparable value of Wilks' Lambda in Danish and Norwegian (0.81 and 0.82) and a higher one in Swedish (0.93). These results match the contrasts between the two comparable declensional systems in Danish and Norwegian and the more complex system in Swedish.

As regards semantic rules, perhaps surprisingly, the variables PERSONAL, NON-PERSONAL ANIMATE and ANIMATE appear only in Danish and Swedish, in contrast with the variables CONCRETE and ABSTRACT which appear in all the three languages with average values. More significant is the contribution of formal variables, including other morphological variables than PLURAL, i.e. DEVERBAL MONOSYLLABLE and SUFFIX together with DEVERBAL NOUN WITH PARTICLE, and two phonological variables: POLYSYLLABILITY and LAST PHONEME LENGTH. The relative importance of the variable GENDER OF HOM/SYN appears to be surprisingly different across the

three languages, varying from the third rank position in Norwegian to the last but one rank in Swedish. Likewise, the weak discriminating power of the variable BASE GENDER does not confirm the results of the quantitative analysis which indicates that there is a strong correlation between the gender of the compound and the gender of its base.

Table 4. Danish

	Step	F entr/rem ¹¹	p-level ¹²	Lambda ¹³	F-value ¹⁴	p-level ¹⁵
PLURAL	1	575.4286	0	0.814792	575.4286	0
DEVERBAL MONO- SYLLABLE	2	198.4331	0	0.755555	380.7828	0
ANIMATE	3	55.11076	2.10E-24	0.739451	274.8252	0
LAST PHONEME LENGTH	4	32.78526	7.13E-15	0.729992	215.579	0
DEVERBAL NOUN WITH PARTICLE	5	18.21457	1.31E-08	0.724773	176.6853	0
GENDER OF HOM/SYN	6	16.44407	7.61E-08	0.72009	150.4226	0
ABSTRACT	7	12.27034	4.83E-06	0.716613	130.9714	0
BASE GENDER	8	8.810967	0.000151	0.714124	115.8772	0
SUFFIX	9	10.32715	3.34E-05	0.711218	104.3381	0
POLY- SYLLABICITY	10	3.991998	0.018521	0.710096	94.35886	0
CONCRETE	11	3.688877	0.025067	0.709061	86.16161	0

Table 5. Swedish

	Step	F entr/rem	p-level	Lambda	F-value	p-level
PLURAL	1	185.7887	0	0.92715	185.7887	0
SUFFIX	2	27.27944	1.66E-12	0.916573	105.2434	0
POLY-SYLLABICITY	3	29.07405	2.82E-13	0.905435	80.23929	0
CONCRETE	4	21.36452	5.80E-10	0.897322	65.76724	0
DEVERBAL MONO-SYLLABLE	5	9.043933	0.00012	0.8939	54.51035	0
LAST PHONEME LENGTH	6	7.349089	0.000651	0.891128	46.71016	0
PERSONAL	7	3.090564	0.045568	0.889963	40.49634	0
NON-PERSONAL ANIMATE	8	5.275509	0.005146	0.887979	36.12542	0
ABSTRACT	9	12.86873	2.67E-06	0.883164	33.61999	0
BASE GENDER	10	3.017261	0.049029	0.882036	30.57253	0
GENDER OF HOM/SYN	11	2.033453	0.130997	0.881277	27.98413	0
DEVERBAL NOUN WITH PARTICLE	12	1.644929	0.193137	0.880663	25.79267	0

Table 6. Norwegian

	Step	F entr/rem	p-level	Lambda	F-value	p-level
PLURAL	1	276.8458	0	0.81668	276.8459	0
CONCRETE	2	26.97395	2.98E-17	0.799196	146.2288	0
GENDER OF HOM/SYN	3	16.19723	1.85E-10	0.788831	102.3736	0
POLY-SYLLABICITY	4	8.337372	1.60E-05	0.78353	78.73171	0
ABSTRACT	5	7.833744	3.29E-05	0.77858	64.55461	0
SUFFIX	6	2.838859	0.036602	0.776789	54.23858	0
LAST PHONEME LENGTH	7	2.492129	0.058338	0.77522	46.83486	0

10. Conclusions

In conclusion, a number of patterns have been observed. As regards the degree of arbitrariness of gender assignment, while it cannot be regarded as completely regular, a substantial proportion of the data was covered by the selected assignment criteria. The results of the discriminant analysis, together with the quantitative analysis of the individual assignment criteria have shown that the analysed criteria cluster around common or masculine gender, as a result of which neuter gender is typically characterized in negative terms. It is only in a few isolated cases that neuter gender can be described as being defined positively. A comparison of the distribution of gender and the status of selected assignment rules in the two areas of the lexicon, native and borrowed, shows that in the latter there is a marked change towards common or masculine genders in terms of type frequency, and towards the assignment rules associated with these genders. Diachronically, these synchronic patterns suggest a continuing expansion of common and masculine genders, which happens at the expense of the weakening rules for neuter gender in the three languages, and feminine gender in Norwegian.

Notes

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- ¹ For a more exhaustive treatment of gender assignment in the three languages see Kilarski (forthc.); Kilarski (in press) deals with the quantitative aspects of the assignment of English loanwords.
 - ² See, e.g., Braunmüller (2000), Hansen (1995) for Danish; E. Andersson (2000), Dahl (2000), Fraurud (2000), Kuhn (1985), Källström (1995, 1996) on Swedish; Enger (2001), Graedler (1996) and Trosterud (2001) on Norwegian.
 - ³ We hereby simplify the picture by not accounting for the differences in adjectival and pronominal agreement. For example, Swedish gender has been interpreted in terms of four traditional genders (Tegnér 1892; Källström 1996), two separate gender systems (grammatical vs. semantic) (Teleman 1987) and individual gender distinctions (Dahl 2000). This nicely shows that different models can be applied – more or less successfully – to a description of the problem. A more exhaustive treatment is needed, in a comparison with Danish and Norwegian (but cf. Enger 2001).
 - ⁴ Initially the study aimed at a comparative analysis of the assignment process in four Scandinavian languages, including Icelandic, together with a possible comparison with Faroese. The two insular languages, Icelandic and Faroese, together with Norwegian Nynorsk, possess the traditional Old Norse three-

gender systems. The following discussion will be based however on Danish, Swedish and Norwegian Bokmål due to the comparable size of the collected data.

⁵ As regards plural inflection, it is an open question whether we can establish an assignment rule according to which the gender of a loanword is assigned on the basis of the indef. pl. ending. According to Corbett (1991: 65), “[d]eclensional type must be included in the lexical entries of Russian nouns and it therefore makes sense to claim that gender specification can be derived from it”. However, it equally makes sense to claim the opposite: while gender has been viewed as the primary criterion for German inflection (e.g., Bittner 1994, 2000; Zubin and Köpcke 1981) drew attention to the role of the frequency with which a noun appears in the plural. This last point is especially relevant in the case of loanwords where the plural may not be assigned at all, or when assigned, may get several competing endings, or most importantly, may be assigned the plural after being assigned the gender. It appears then that we should allow for two directions of motivation (cf. Doleschal 2000; Enger 2000; Zubin and Köpcke 1981), and as a result, the status of this assignment rule should be treated with caution.

⁶ For Danish: Sørensen (1997) and *Retskrivningsordbogen* (1996); for Swedish: Seltén (1993), *Svenska akademiens ordlista* (1996) and *Nationalencyklopedins ordbok* (1999); and for Norwegian: Graedler and Johansson (1997).

⁷ The figures are based on Hansen (1995) and Sørensen (1995) for Danish; A.-B. Andersson (1992) and Källström (1996) for Swedish; and Trosterud (2001) for Norwegian.

In order to facilitate the comparison with native nouns excluded are nouns which vacillate in assignment and nouns without an assigned gender. Typically for borrowings, they constitute a sizeable group, here ranging from between 19.9% in Danish to 22.7% in Swedish and 25.3% in Norwegian.

⁸ Interestingly, parallel figures are given by Jarvad (1995) in her dictionary of neologisms in Danish for the period 1955–1998. The share of common nouns is larger both among native nouns (80% vs. 20%) and loanwords (90% vs. 10%).

⁹ See Tables 4–6 for a list of the variables that were accepted by the model in the three languages.

¹⁰ While we here describe common and masculine genders as positively characterized, these genders can also be interpreted as default. This should be done with caution, however, as the notion has been used in a number of often contradictory ways. Nevertheless, it may certainly be useful in accounts of gender assignment and agreement – cf. the recent Corbett and Fraser (2000), Fraser and Corbett (1995), Rice and Steinmetz (2000).

¹¹ The effect of the stepwise discriminant analysis depends on the value of F to enter and F to remove values. The greater the F value for a given variable the greater its statistical significance in the discrimination between genders. This

means that F reflects the extent to which the variable contributes to the prediction of group membership.

¹² P-value for F to enter / F to remove.

¹³ Wilk's lambda; the test statistic reflecting the relative discriminating power of the variable.

¹⁴ F-value for Wilk's lambda.

¹⁵ P-level for the that F-value.

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