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Adaptation Rates of West Old Turkic Loanwords in Hungarian: A Quantitative Study

Macarcadaki Eski Batı Türkçesi Ödünçleme Sözcüklerin Uyum Oranları: Bir Nicel Analiz

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Abstract: The study presents and evaluates the phonetic adaptations of 377 *West old Turkic* loanwords in Hungarian by measuring the *phonetic distance* with the *Levenshtein distance* formula. A more sensitive *edit distance* algorithm is proposed with a reduced *operation cost* for less distant assimilations. A “distinctive feature” weighted approach is adopted for the task, and the set of phonemes concerning Turkic and Hungarian languages are evaluated and categorized in a distinctive feature matrix by their features. Reconstructed WOT words in their latest form before the borrowing, were used for the data. These are treated as the origins of the relevant vocabulary in Hungarian. The adaptation rate is quantified for each word pair and overall. In addition to this, several patterns in terms of regular adaptations are discussed, and some problematic issues regarding the calculation of the distance between some particular sounds in both languages are brought out. While this paper is a continuation of the ongoing trend of emphasizing refinement approaches to operation costs in Levenshtein algorithms, it is also an attempt to formulate loanword adaptation by using linguistic typology. Turkic languages and Hungarian are two sides that shared historically the same *sprachbund* for a long period and are known to have some mutualities such as agglutinative structures, harmonical features, rich vowel inventories, etc, this study also holds the motivation to be a contribution to the field of *contact linguistics*.

Structured Abstract: Within their etymological journeys, borrowings quite often go through phonetic assimilations in order to fit in the phonetic/phonological system of the target language. The longer the time they exist in the target language, the more significant and defining the adaptations apparently are. WOT (Oghur) material in Hungarian is no exception. Given the fact that almost all the known WOT words that appear in Hungarian today are pronounced differently compared to their source forms, the question of “at what rate did that happen?” concerns this study primarily. In order to quantify the rate of the phonetic changes that have occurred, a refined Levenshtein distance (LD) formula that is weighted by distinctive

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features is used. Other than the issue of how much the WOT words are adapted to the Hungarian language, the way they did is another ax to grind. Was it completely random by perception or were there certain patterns of sound changes? The objectives of the study, therefore, are as the following; (1) To quantify the adaptation rates of the WOT loanwords in Hungarian. (2) To detect the patterns and regularities in the nativization of WOT words in Hungarian. (3) To adopt measurement methods of phonetic distance into loan phonology. (4) To attempt to refine the edit distance algorithm into a more sensitive form.

384 WOT etymologies are given in the voluminous etymological dictionary of (Róna-Tas & Berta, 2011), 377 of these are reconstructed. The size of this data is so far the largest ever among all relevant studies. The authors state that all the data were taken from the cited texts or dictionaries. Some of the lexemes are archaic or dialectal, some of them are not in use anymore, and most of them are from the present Hungarian literary language. While a considerable set of these heads in the lexicon are of dubious or possible Turkic origin (marked with a single asterisk in this study), a handful of them are of non-Turkic origin but were loaned from WOT into Hungarian (marked with a double asterisk). Turkic etymology of the disputed words is most likely (Róna-Tas & Berta, 2011, p. 1489). For the comparison of the 377-word pairs, the latest reconstructed WOT forms and the latest Hungarian forms are considered. For the orthographic display of the WOT words, Turkish orthography is used. Phonetic transcriptions of the lexemes are presented in brackets.

The problem is that the classical LD application supposedly fails to reflect the phonetic distance between two words in fine detail due to the reason that the phoneme pairs are rarely in equal distance to each other. It is necessary to modify the operation cost in Levenshtein algorithms so that a more sensitive and perceptually acceptable edit distance can be achieved. The approach which is applied in this study is a comprehensive version of the “sound class-based Levenshtein algorithm”. This method assesses the phonemes with respect to their distinctive features. This puts the sounds in groups according to their features, making them less or more distant from each other in compliance with the number of mutual features that they share, therefore being subject to less or more penalty points in the operation cost accordingly. Such approaches considering several different phonetics and phonology theories and rules can be seen in the literature but the issue of how many penalty points to be applied for a simple one-feature change seemingly remains a determining problem as the refinement methods differ substantially.

Since the operation cost is refined according to the differences in the distinctive features of the adaptations, for each difference in features, a designated penalty point is applied. The idea behind this formulation is that a single feature change is hypothetically not enough to match a full perceived distance on a pair of phonemes, but it may be rather conceived as a modification (allophone) of the same phoneme which is indeed the case for some adaptations. Some examples are tense and lax counterparts of the vowels, velarization, palatalization, etc. There are 20 distinctive features addressed for this approach, covering Hungarian and Turkic phonemes, and they fall under five base categories as shown below.

- Major class features (syllabic, consonantal, sonorant)
- Laryngeal features (voice, spread glottis)
- Manner features (continuant, nasal, lateral, delayed-release)
- Place features (labial (round), coronal (anterior, distributed), dorsal)
- Vowel space (high/low/mid, back, tense)

For an adaptation to have 1 full penalty point from a particular base category, all the sub-features of that category should be in contrast in the pair. That being the case, in this approach the features that belong to a particular base category should equally participate in the measurement of the distance. Very distinct pairs and vowel-to-consonant and vice versa adaptations would generally cost more than a full penalty point, further sensitizing the operation cost. A standard 2 penalty points approach for the vowel-to-consonant and vice versa adaptations is problematic since these types of assimilations are not always equally distant either.

The pronunciation distance of the 377-word pairs is on average 34.96. Therefore, the Hungarian adaptations and the WOT origins of this set of words are 65.04% identical (homophones). The most frequent tendencies in terms of adaptations mirror the phonological disposition of Hungarian towards the nativization process of loanwords. The most striking adaptation patterns are displayed in the study. Those appearances concern: heavy syllables, nasal palatalization and alveolarization, high back unrounded vowel, voiced velar fricative, labialization of vowels, alveolarization of velar [ɣ], adaptation from [j] to [j], +/- low quality of the front unrounded vowels [a] and [æ], and adaptation from [tʃ] to [ʃ].

Although the principles are default, refinement approaches to the operation cost in the Levenshtein algorithms make significant differences in terms of acquired results. Reflection rates of some adaptations in human perception may be little to none. Some adaptations, on the other hand, may sound obvious but still less distant than others. Perhaps, to begin with, a computerized (or non-computerized) advancement of a measurement methodology that evaluates the perceived distance of a certain set of sounds particular to two phonological systems may be a good approach. A database that is big enough to consist of a sufficient number of co-occurrences of the same sound pairs is needed to achieve this. In any case, it is necessary to have big data with a large word base to apply the LD and obtain meaningful, consistent findings. The refinement strategies require a good command of the phonological knowledge of the compared languages.

Keywords: Historical linguistics, diachronic linguistics, contact linguistics, loanword adaptation, Oghur, Hungarian, Levenshtein distance, operation cost, phonetic assimilation, edit distance, distinctive features

Öz: Çalışma, 377 *Eski Batı Türkçesi* (West Old Turkic - WOT) ödünçleme sözcüğün Macarcadaki sesbilgisel adaptasyonunu *Levenshtein uzaklık formülü* ile *sesbilgisel uzaklığı* ölçerek sunmakta ve değerlendirmektedir. Daha az mesafeli benzeşmeler için daha düşük *ceza puanı* ile daha hassas bir *düzenleme mesafesi* algoritması önerilmiştir. Bu görev için “ayrıt edici özellik” ağırlıklı bir yaklaşım benimsenmiş, Türk ve Macar dillerine ait sesbirimleri kümesi, bir ayrıt edici özellik matrisinde değerlendirilmiş ve sınıflandırılmıştır. Veri olarak, ödünç alınmadan önceki son halleriyle yeniden yapılandırılmış Macarcadaki Eski Batı Türkçesi sözcükler kullanılmıştır. Bunlar Macarcadaki ilgili söz varlığının kökenleri olarak ele alınmaktadır. Adaptasyon oranı, her bir sözcük çifti için ve toplam olmak üzere ayrı ayrı ölçülmüştür. Buna ek olarak, düzenli adaptasyonlar açısından bazı belirli örüntüler tartışılmış ve her iki dildeki belirli bazı sesler arasındaki mesafenin hesaplanmasıyla ilgili sorunlu konular ortaya çıkarılmıştır. Bu makale, Levenshtein algoritmalarındaki ceza puanlarına ilişkin hassasiyetleştirme yaklaşımlarını vurgulamaya yönelik süregelen eğilimin bir devamı olmakla birlikte, aynı zamanda dilsel tipolojiyi kullanarak ödünçleme sözcük adaptasyonlarını formüle etmeye yönelik bir diğer girişimdir. Türk dilleri ve Macarca, tarihsel olarak uzun süre aynı *sprachbund'u* paylaşan; sondan eklemeli yapılar, ünlü uyumu özellikleri, zengin ünlü envanterleri vb. gibi ortak yönleri olduğu bilinen iki grup olduğundan, bu çalışma aynı zamanda *etkileşimsel dilbilim* alanına katkı sağlama motivasyonunu da ayrıca taşımaktadır.

Anahtar Kelimeler: Tarihsel dilbilim, artsüremli dilbilim, etkileşimsel dilbilim, ödünçleme sözcük adaptasyonu, Oğur öbeği, Lir Türkçesi, Macarca, Levenshtein uzaklık formülü, ceza puanı, benzeşme, düzenleme mesafesi, ayrıt edici özellikler

Introduction

Loanwords of Turkic origin in the Hungarian language are rather numerous due to extensive contact that took place in several different stages of history between the Hungarians and different Turkic-speaking groups. These age-long and complicated interactions occurred in different parts of Eurasia all the way from *Magna Hungaria* -as referred to in medieval sources- to the *Pontic steppe* and the *Carpathian Basin*. The association continued after the medieval era. Loanwords being numerous, and prototypical features of Turkic languages relatively similar to Hungarian, some scholars associated the parties with each other, especially in the late 19th and early 20th centuries. *The Ural-Altai hypothesis* which was proposed by Matthias Castrén (Stammler-Gossmann, 2009, p. 202) groups Turkic, Mongolic, and Tungusic as *Altaic*, whilst Finno-Ugric and Samoyedic as *Uralic*. German philologist Friedrich Max Müller labels in his work (Müller, 1855, p. 86) non-Aryan and non-Semitic Asian languages as *Turanian* with the exception of Chinese. Today the Altaic hypothesis is not widely credited anymore (Vovin, 2005, p. 73) as Turkic, Mongolian, and Tungusic are not seen as direct descendants of a common family. Uralic and Turkic languages on the other hand are seen as two groups of neighbors that belong to a *sprachbund* (Helimski, 2003, p. 159) rather than being genetically related. Hungarian Turkologist Ármín Vámbéry tried to prove in the late 19th century in his work *Hungarian and Turco-Tatar word cognates* (Vámbéry, 1870) by making comparisons between words, that Hungarian is a dual

language with both Uralic and Turkic features and that's the result of intense early Hungarian encounters with Turkic groups (Marác, 2012). This view started a two-decade period of academic debate called *The Ugric-Turkic war*. The head of the Ugric defender of the debate was József Budenz. He retaliated to Vámbéry one year after in 1871 (Budenz, 1871), arguing that all the Turkic words in Hungarian are loanwords and not genetically inherited. The debate ended with the Ugric party getting more credit, and to this day, Hungarian is acknowledged as a Finno-Ugric language and the numerous Turkic words are all loanwords mostly borrowed from Oghur. As of today, in light of the new information in modern linguistics, the Hungarian language is accepted widely as a member of the Finno-Ugric branch of the Uralic family, and Turkic influence is acknowledged as a result of early –and latter– language contact.

The actors on the Turkic side of these historical relationships were multifarious from different branches of the Turkic language family. Pechenegs and Ottomans from the Oghuz branch, Cumans from the Kipchak branch, Bulgar-Turkic, and Khazar (its classification is disputed) (Róna-Tas, 2007, p. 270) from the Oghur branch are some prominent ones. The group that left the most predominant impact on the Hungarian vocabulary was a member of the West old Turkic (WOT) branch, the Oghur-speaking people. This contact happened long before Hungarians migrated into the Carpathian basin (honfoglalás). The word “Ungar” (Hungarian) itself is considered to be derived from the name “Onoğur”, meaning ten tribes or ten arrows in Turkic (Benkő & Imre, 1972, p. 31).

“The Hunnic migrations brought Oghur Turkic nomads westwards into contact with the ancestors of the Hungarians. This contact, the details and precise chronology of which are unknown to us must have been culturally decisive for the ancestors of the Hungarians were transformed into an equestrian, pastoral-nomadic steppe people and came fully into the steppe in what is today Baskiria, the «Magna Hungaria» of the medieval sources” (Golden, 1992, p. 261).

As the Turkic language family fundamentally diverges into two main branches (Johanson, 2016) – common Turkic and Oghur – all the Turkic languages which are grouped under the common Turkic branch, differ substantially from Oghur. The only extant member of the Oghur branch today is Chuvash (Savelyev, 2020, p. 446), spoken primarily in the Chuvash Republic by some one million speakers (Alós i Font, 2014, p. 53). The majority of the Turkic words in Hungarian show featural analogy with Chuvash (Róna-Tas & Berta, 2002, p. 47).

Within their etymological journeys, borrowings quite often go through phonetic assimilations in order to fit in the phonetic/phonological system of the target language. The longer the time they exist in the target language, the more significant and defining the adaptations apparently are. WOT (Oghur) material in Hungarian is no exception. Given the fact that almost all the known WOT words that appear in Hungarian today are pronounced differently compared to their source forms, the question of “at what rate did that happen?” concerns this study primarily. In order to quantify the rate of the phonetic changes that have occurred, a refined Levenshtein distance (LD) formula that is weighted by distinctive features is used. Distinctive features and categories of sounds are grouped together in compliance with the mutual features. To exemplify as in the sonority hierarchy, vowels are considered [+syllabic], whereas consonants are considered [-syllabic]. Other than the issue of how much the WOT words are adapted to the Hungarian language, the way they did is another ax to grind. Was it completely random by perception or were there certain patterns of sound changes? It should be taken into consideration of course that the latter case may still serve the perceptual approach of the debate in “loanword adaptation” since there are two main proposals in this study field; *the phonological stance model* that is based on the nativization through production view, and the *perceptual stance model* (phonetic model) that is based on the nativization through perception view (Paradis & Tremblay, 2009, p. 212). The objectives of the study, therefore, are as the following; (1) To quantify the adaptation rates of the WOT loanwords in Hungarian. (2) To detect the patterns and regularities in the nativization of

WOT words in Hungarian. (3) To adopt measurement methods of phonetic distance into loan phonology. (4) To attempt to refine the edit distance algorithm into a more sensitive form.

The study can also contribute to the research area of the Old Hungarian language. Jenő Kiss states in his review of the work of (Honti, 2017): “Among the derived words that came into Hungarian before the *honfoglalás*, the overwhelming majority are those of Old Turkic origin, compared to the rest. This means that Old Turkic words play a key role in Proto-Hungarian language research” (Kiss, 2018a, p. 226).

Although there is a consensus almost to the most extent today on Turkic languages and Hungarian belonging to different language families; morpho-syntactic and phonological resemblances between them such as agglutinative structures, vowel harmony, grammatical genderlessness, prodrop features, and rich vowel inventories clearly substantiate a close link, setting aside the excessive number of Turkic loanwords in Hungarian. Some of the other parallel aspects are consonant assimilation or consonant harmony, affricate sounds, and consonant deletions when they are accumulated (Bekar, 2013 p. 80).

Data

384 WOT etymologies are given in the voluminous etymological dictionary of (Róna-Tas & Berta, 2011). 377 of these are reconstructed. The size of this data is so far the largest ever among all relevant studies. The book has been dealt with by many Hungarian and international researchers since its publication as they are listed in (Honti, 2017, p. 7). The authors state that all the data were taken from the cited texts or dictionaries. Some of the lexemes are archaic or dialectal, some of them are not in use anymore, and most of them are from the present Hungarian literary language. While a considerable amount of these heads in the lexicon are of dubious or possible Turkic origin, a handful of them are of non-Turkic origin but were loaned from WOT into Hungarian. Turkic etymology of the disputed words is most likely (Róna-Tas & Berta, 2011, p. 1489). The questionable lexemes of the dictionary were analyzed by Honti: “In this study, I am dealing with all words whose origins have been criticized by the authors of the publication so far, and in connection with them I sometimes also have something to say about other etymologies” (Honti, 2017, p. 7). We are convinced that we should not make any decision regarding these doubtful cases as this is not the main focus of our research.

For the comparison of the 377-word pairs, the latest reconstructed WOT forms and the latest Hungarian forms are taken into account. For the orthographic display of the WOT words, Turkish orthography is used. Phonetic transcriptions of the lexemes are presented in brackets. English translations are given on top of the tables.

Methodology

Although the LD is applied mainly to the relative languages in order to measure mutual intelligibility or to help with reconstruction studies, the formula has proven to be efficient also in loan phonology even for genetically and typologically distant languages such as Russian-Dolgan (Stachowski K., 2010) or Kipchak Turkic-Iranian (van der Ark et al., 2007).

“It seems that LD is much more often applied to phonologically quite similar languages such as Dutch, English, German, or Norwegian dialects. Moreover, most of these languages are phonotactically relatively rich and therefore lenient, which appears to be the key here” (Stachowski K., 2011, p. 155).

The classical application of the LD requires *phonemic alignment*, and also the “3 algorithm formulation” that presents itself as *insertion*, *deletion*, and *substitution*. The phonemic alignment is a meticulous process in which the phonemes of the pair are matched with each other. Extra or missing phonemes appear as insertions and deletions. The phonemes that are different in each alignment appear as substitutions. For each insertion, deletion, and substitution a designated

penalty point (operation cost) is applied in order to reveal the necessary number of edits that are required to change one unit into another (edit distance).

In the example presented in Table 1, six alignments can be observed between the Hungarian word and its Cuman origin. Three of these appear as penalties, one being a deletion and two being substitutions. *The labial velar approximant* that exists in the source word is missing in the target word with no substitution counterpart. Comparisons that cost penalty points will be shown in **bold red** throughout the study. Three penalty points out of six alignments conclude a 50% distance between the pair.

Table 1: An example of the classical phonetic distance calculation

| ‘stallion’ | |
|------------------|---|
| H. <i>csődör</i> | [t̪ ^h ø : - d ø r] |
| C. <i>çewdür</i> | [t̪ ^h e w d y r] |
| Penalties | 3 |
| N-align | 6 |
| LD% | 50 |

The problem here is that the LD supposedly fails to reflect the phonetic distance between two words in fine detail due to the reason that the phoneme pairs are rarely in equal distance to each other. It is necessary to modify the operation cost in Levenshtein algorithms so that a more sensitive and perceptually acceptable edit distance can be achieved. Several refined algorithm methods have been proposed in the literature in order to achieve the above-mentioned. One example is the pointwise mutual information (PMI) based Levenshtein algorithm, according to which the distances are measured by the PMI values, calculated by the frequency of collocation of two units in a designated corpus. Another method is computerizing the acoustic features of sound frequencies by visualizing them on a spectrogram. This approach is referred to as the spectrogram-based Levenshtein algorithm (Zhang, 2018, p. 11). The failure of the classical LD approach and the need for a phonologically sensitive method can be seen as an example in the citation below.

“Using the Levenshtein algorithm to calculate phonological distances between lexical units does not account for the fact that two phonemes may be more or less close depending on the number of distinctive features they share together. For example, the distance between the French words [bo] (beau) and [p̃o] (pont) is the same as between [bo] (beau) and /ði/ (riz), even though the first pair of words shares more phonological features than the second pair and may thus be thought as much closer perceptively” (Fontan et al., 2016, p. 650).

The approach which is applied in this study is a comprehensive version of the “sound class-based Levenshtein algorithm”. This method assesses the phonemes with respect to their distinctive features. This puts the sounds in groups according to their features, making them less or more distant from each other in compliance with the number of mutual features that they share, therefore being subject to less or more penalty points in the operation cost accordingly. One example of this approach is given by (McCoy & Frank, 2018). They would apply one penalty point for the change of [d] into [t] as only one distinctive feature is changed that being the *voicing*. For /b/ into [t] however, they would apply two penalty points since this time not only the voicing, but the *place of articulation* (placing) is different as well. Approaches considering several different phonetics and phonology theories and rules can be seen in the literature such as feature theory (Jakobson et al., 1951) or probabilistic methods (Sanders & Chin, 2009, pp. 96-114) but the issue of how many penalty points to be applied for a simple one-character change seemingly remains as a determining problem as the refinement methods differ substantially.

Since the operation cost is refined according to the differences in the distinctive features of the adaptations, for each difference in features, a designated penalty point is applied. The idea

behind this formulation is that a single feature change is hypothetically not enough to match a full perceived distance on a pair of phonemes, but it may be rather conceived as a modification (allophone) of the same phoneme which is indeed the case for some adaptations. Some examples are tense and lax counterparts of the vowels, velarization, palatalization, etc. There are 20 distinctive features addressed for this approach, covering Hungarian and Turkic phonemes, and they fall under 5 base categories as shown below. The effort here is to include any feature that makes a difference even in one pair among all the combinations. The *constricted glottis* feature is therefore not included as it does not apply to any phonemes in the languages that are subject to comparison in this study. In the same way, the *radical* feature is not included either since there is no epiglottal consonant in the set. The *strident* feature which is mainly used to distinguish the interdental fricative from the alveolar fricative, as well as some other types of fricatives, is neglected also since it appears as a sub-feature of a sub-feature and supposedly would need extra refining.

- Major class features (syllabic, consonantal, sonorant)
- Laryngeal features (voice, spread glottis)
- Manner features (continuant, nasal, lateral, delayed-release)
- Place features (labial (round), coronal (anterior, distributed), dorsal)
- Vowel space (high/low/mid, back, tense)

For an adaptation to have 1 full penalty point from a particular base category, all the sub-features of that category should be in contrast in the pair. For example, the sound [a] is [+low], [+back], and [-tense] while [y:] is [+high(-low)], [-back] and [+tense]. Therefore, this pair shows full contrast in terms of the “vowel space” base category. The reason that a full penalty should be equal to 1, is that every phoneme in a lexeme (or every digit in a unit) matches with only one other and takes the space of 1 alignment. Consequently, for a hypothetical one-phoneme word to be %100 distant from another one-phoneme word, there needs to be 1 penalty point between the sides. That being the case, in this approach the features that belong to a particular base category should equally participate in the measurement of the distance. In the case of vowel space, 0.33 penalty points would be applied for contrast in [+high], 0.33 for [+back], and again 0.33 for [+tense] since there are three features in this category. Considering the fact that this pair in the example above also shares a difference in placing, [a] being [-labial] and [y:] being [+labial(+round)] and knowing that the place category also has three main features (labial, coronal, dorsal), 0.33 additional points would be added. Therefore, the distance between the pair would cost 1.33 points in total. That being the case, very distinct pairs, and vowel-to-consonant and vice versa adaptations would generally cost more than a full penalty point, further sensitizing the operation cost. A standard 2 penalty points approach for the vowel-to-consonant and vice versa adaptations is problematic since these types of assimilations are not always equally distant either. The refinement criteria are applied to the above-given Cuman source word in Table 2.

The explanation for the application of the refined LD algorithm on this particular exemplification is as the following: There are 6 phonemic matches between the words. This gives us the phonemic alignment (N-align) value. The Hungarian word has 1 less phoneme than the source word. That indicates a deletion. If an extra phoneme was added to the Hungarian word, that would mean an insertion. Deletion of /w/ costs half penalty points instead of 1. The reason for that is that the glide in the example is a transitional sound and it only modifies the preceding vowel by creating a diphthong, rather than acting as a separate phoneme. This is explained further in the relevant section where the refinement criteria for the “voiced velar fricative” is exposed. There are also 2 substitutions. “The substitution cost of /ø:/ → /e/ is 0.66. The former is [+labial] and [+tense] while the latter is [-labial] and [-tense]. These features cost 0.33 points each since the categories they belong to (place and vowel space categories) have three features each. Therefore 1/3 penalty points would be applied for each of these features. Finally, the cost of ø → y is 0.33 as they differ in

highness only. The sum of these penalties is equal to 1.5 which is the %25 of the alignment value; 6.” That gives us the phonemic distance between the two lexemes.

Table 2: Refined distance

| ‘stallion’ | |
|------------------|----------------------------------|
| H. <i>csődör</i> | [t̃j̃ ^h o: - d o r] |
| C. <i>çewdür</i> | [t̃j̃ ^h e w d y r] |
| Penalties | 1.5 |
| N-align | 6 |
| LD% | 25 |

For insertions and deletions, 1 penalty point is applied. An example can be seen in Table 3.

Table 3: Refinement for deletions

| ‘to be forgiven’ | |
|----------------------|----------------------------------|
| H. <i>bocsán(ik)</i> | [b o - t̃j̃ ^h a: n] |
| WOT. <i>Bolçan</i> | [b o t̃j̃ ^h a n] |
| Penalties | 1.33 |
| N-align | 6 |
| LD% | 22.17 |

Some sub-features have their further sub-features (Clements & Keyser, 1983). These are labial (round), coronal (anterior, distributed), and dorsal (high, back). In the case of labial, coronal, or dorsal features being parallel but the super-sub-features differing in a pair, $0.33/2=0.16$ penalty points are to be applied for each of them. In Table 4, the adaptation from [ð] to [z] costs 0.16 penalty points since the former is [+distributed] and the latter is [-distributed] despite both sounds being [+coronal].

Table 4: Further refinement for super-sub features

| ‘bustard’ | |
|--------------------|------------------|
| H. <i>túzok</i> | [t u: - z o k] |
| WOT. <i>Togzak</i> | [t o g ð a k] |
| Penalties | 2.49 |
| N-align | 6 |
| LD% | 41.5 |

Gemination or consonant lengthening and degemination appear parallel to tenseness in vowels and the same cost (0.33) is applied for this alternation. An example is presented in Table 5.

Table 5: Refinement for gemination

| ‘beard’ | |
|-------------------|-----------------|
| H. <i>szakáll</i> | [s o k a: l:] |
| WOT. <i>Sakal</i> | [s a k a t̃] |
| Penalties | 1.33 |
| N-align | 5 |
| LD% | 26.6 |

Metathesis is observed in some adaptations and if the sounds in transposition are the same, 1 penalty point is applied, if they are also substituted, the extra cost is additionally applied. In Table

6, [k] sound and the neighboring vowels are subject to transposition; therefore 1 penalty point is applied while another 0.66 is applied for the substitution from [i] to [o].

Table 6: Refinement for metathesis

| ‘gauntry, gantry (for supporting barrels)’ | |
|--|---------------|
| H. <i>ászok</i> | [a : s o k] |
| WOT. <i>Askı</i> | [a s k ĩ] |
| Penalties | 2 |
| N-align | 4 |
| LD% | 50 |

The open central unrounded vowel [a] acts as a back vowel in the harmonical system of Hungarian and Turkish. Vowel harmony is very typical in all Turkic languages just as it is typical in Hungarian, and this originally central sound apparently fits in the harmonical system and displays the [+back] feature. Therefore, this sound is evaluated as [+back] in the matrix since [+central] is not included in this matrix. It is lacking in the other vowels of the set in the first place.

The voiced velar fricative [ɣ] in modern Turkish, orthographically shown with the letter <ğ> has become silent and has no sound of its own (Selen, 1979; Ergenç & Uzun, 2020; Ünal-Logacev et al., 2019; Uzun, 2021), with its effect varying depending on its location in a word and the surrounding vowels. This is a recent condition as in Ottoman Turkish the non-silent variant was in use (Ünal et al., 2019, p. 187) as well as in some dialects and other Turkic languages today. Therefore, there is no reason to think that in the old Turkic, it was silent. However, it can be argued that it still carried a transitional characteristic and the proof for that is that it always appears after a vowel in the WOT data. Also, the quality of the sound is apparently not as interruptive as a non-semivowel. It can be observed from the data that 98 occurrences of [ɣ] out of 108 display either deletion or substitution with [j] as adaptations. For these reasons, the insertions and deletions of this sound cost a semi (0.5) penalty point. In the same way insertions and deletions of [j] which is also a transitional semivowel and [w] cost semi-penalty points as well. A demonstration of this refinement is in Table 7.

Table 7: Refinement for the voiced velar fricative

| ‘pea, bean’ | |
|--------------------|-------------------|
| H. <i>borsó</i> | [b o r j o -] |
| WOT. <i>Burçağ</i> | [b u r t j a ɣ] |
| Penalties | 2 |
| N-align | 6 |
| LD% | 33.33 |

[e] and [ɛ] sounds share all the same features except [+low], although they are both officially mid sounds. The former being closer to the high category (high-mid) and the latter being closer to the low category (low-mid) the appropriate penalty point for the [+low] feature is applied (0.33).

The distinctive features matrix of Turco-Hungarian phonemes is displayed in Table 8 and Table 9.

Table 8: Distinctive features matrix of Turco-Hungarian Phonemes (1)

| IPA | MAJOR CLASS FEATURES | | | LARYNGEAL FEATURES | | MANNER FEATURES | | | |
|------|----------------------|-------------|----------|--------------------|----------------|-----------------|-------|---------|-----------------|
| | syllabic | consonantal | sonorant | voice | spread glottis | continuant | nasal | lateral | delayed release |
| [p] | + | - | + | + | - | + | - | - | - |
| [a] | + | - | + | + | - | + | - | - | - |
| [a:] | + | - | + | + | - | + | - | - | - |
| [æ] | + | - | + | + | - | + | - | - | - |
| [ɛ] | + | - | + | + | - | + | - | - | - |
| [e] | + | - | + | + | - | + | - | - | - |
| [e:] | + | - | + | + | - | + | - | - | - |
| [i] | + | - | + | + | - | + | - | - | - |
| [i:] | + | - | + | + | - | + | - | - | - |
| [u] | + | - | + | + | - | + | - | - | - |
| [o] | + | - | + | + | - | + | - | - | - |
| [o:] | + | - | + | + | - | + | - | - | - |
| [ø] | + | - | + | + | - | + | - | - | - |
| [ø:] | + | - | + | + | - | + | - | - | - |
| [u] | + | - | + | + | - | + | - | - | - |
| [u:] | + | - | + | + | - | + | - | - | - |
| [Y] | + | - | + | + | - | + | - | - | - |
| [y:] | + | - | + | + | - | + | - | - | - |
| [B] | - | + | - | + | - | - | - | - | - |
| [C] | - | + | - | - | - | - | - | - | - |
| [D] | - | + | - | + | - | - | - | - | - |
| [dz] | - | + | - | + | - | - | - | - | + |
| [dʒ] | - | + | - | + | - | - | - | - | + |
| [f] | - | + | - | - | - | + | - | - | - |
| [g] | - | + | - | + | - | - | - | - | - |
| [ɣ] | - | + | - | + | - | + | - | - | - |
| [h] | - | - | - | - | + | + | - | - | - |
| [χ] | - | + | - | - | + | + | - | - | - |
| [j] | - | - | + | + | - | + | - | - | - |
| [ɟ] | - | + | - | + | - | - | - | - | - |
| [k] | - | + | - | - | - | - | - | - | - |
| [l] | - | + | + | + | - | + | - | + | - |
| [ɭ] | - | + | + | + | - | + | - | + | - |
| [m] | - | + | + | + | - | - | + | - | - |
| [n] | - | + | + | + | - | - | + | - | - |
| [ŋ] | - | + | + | + | - | - | + | - | - |
| [p] | - | + | + | + | - | - | + | - | - |
| [p̥] | - | + | - | - | - | - | - | - | - |
| [r] | - | + | + | + | - | + | - | - | - |
| [s] | - | + | - | - | - | + | - | - | - |
| [ʃ] | - | + | - | - | - | + | - | - | - |
| [t] | - | + | - | - | - | - | - | - | - |
| [ts] | - | + | - | - | - | - | - | - | + |
| [tʃ] | - | + | - | - | - | - | - | - | + |
| [v] | - | + | - | + | - | + | - | - | - |
| [z] | - | + | - | + | - | + | - | - | - |
| [ð] | - | + | - | + | - | + | - | - | - |
| [ʒ] | - | + | - | + | - | + | - | - | - |
| [w] | - | - | + | + | - | + | - | - | - |

Table 9: Distinctive features matrix of Turco-Hungarian Phonemes (2)

| IPA | PLACE FEATURES | | | | | VOWEL SPACE | | | | |
|------|----------------|-------|---------|----------|-------------|-------------|------|------|-----|-------|
| | labial | round | coronal | anterior | distributed | dorsal | high | back | low | tense |
| [ɒ] | + | + | - | n/a | n/a | + | - | + | + | - |
| [a] | - | n/a | - | n/a | n/a | + | - | + | + | - |
| [a:] | - | n/a | - | n/a | n/a | + | - | + | + | + |
| [æ] | - | n/a | - | n/a | n/a | + | - | - | + | - |
| [ɛ] | - | n/a | - | n/a | n/a | + | - | - | - | - |
| [e] | - | n/a | - | n/a | n/a | + | - | - | - | - |
| [e:] | - | n/a | - | n/a | n/a | + | - | - | - | + |
| [i] | - | n/a | - | n/a | n/a | + | + | - | - | - |
| [i:] | - | n/a | - | n/a | n/a | + | + | - | - | + |
| [u] | - | n/a | - | n/a | n/a | + | + | + | - | - |
| [o] | + | + | - | n/a | n/a | + | - | + | - | - |
| [o:] | + | + | - | n/a | n/a | + | - | + | - | + |
| [ø] | + | + | - | n/a | n/a | + | - | - | - | - |
| [ø:] | + | + | - | n/a | n/a | + | - | - | - | + |
| [u] | + | + | - | n/a | n/a | + | + | + | - | - |
| [u:] | + | + | - | n/a | n/a | + | + | + | - | + |
| [y] | + | + | - | n/a | n/a | + | + | - | - | - |
| [y:] | + | + | - | n/a | n/a | + | + | - | - | + |
| [b] | + | - | - | n/a | n/a | - | n/a | n/a | | |
| [c] | - | n/a | + | - | + | + | + | - | | |
| [d] | - | n/a | + | + | - | - | n/a | n/a | | |
| [dz] | - | n/a | + | - | + | - | n/a | n/a | | |
| [dʒ] | - | n/a | + | - | + | - | n/a | n/a | | |
| [f] | + | - | - | n/a | n/a | - | n/a | n/a | | |
| [g] | - | n/a | - | n/a | n/a | + | + | - | | |
| [ɣ] | - | n/a | - | n/a | n/a | + | + | + | | |
| [h] | - | n/a | - | n/a | n/a | - | n/a | n/a | | |
| [χ] | - | n/a | - | n/a | n/a | + | + | + | | |
| [j] | - | n/a | - | n/a | n/a | + | + | - | | |
| [ʃ] | - | n/a | + | - | + | + | + | - | | |
| [k] | - | n/a | - | n/a | n/a | + | + | + | | |
| [l] | - | n/a | + | + | - | - | n/a | n/a | | |
| [ʎ] | - | n/a | + | + | - | + | + | + | | |
| [m] | + | - | - | n/a | n/a | - | n/a | n/a | | |
| [n] | - | n/a | + | + | - | - | n/a | n/a | | |
| [ŋ] | - | n/a | - | n/a | n/a | + | + | + | | |
| [ɲ] | - | n/a | + | - | + | + | + | - | | |
| [p] | + | - | - | n/a | n/a | - | n/a | n/a | | |
| [r] | - | n/a | + | + | - | - | n/a | n/a | | |
| [s] | - | n/a | + | + | - | - | n/a | n/a | | |
| [ʃ] | - | n/a | + | - | + | - | n/a | n/a | | |
| [t] | - | n/a | + | + | - | - | n/a | n/a | | |
| [ts] | - | n/a | + | + | - | - | n/a | n/a | | |
| [tʃ] | - | n/a | + | - | + | - | n/a | n/a | | |
| [v] | + | - | - | n/a | n/a | - | n/a | n/a | | |
| [z] | - | n/a | + | + | - | - | n/a | n/a | | |
| [ð] | - | n/a | + | + | + | - | n/a | n/a | | |
| [ʒ] | - | n/a | + | - | + | - | n/a | n/a | | |
| [w] | + | + | - | n/a | n/a | + | + | + | | |

*n/a: not available.

Adaptation rates of WOT loanwords in Hungarian

The pronunciation distance of the 377-word pairs is on average 34.96. Therefore, the Hungarian adaptations and the WOT origins of this set of words are 65.04% identical (homophones). Turkic material in Hungarian is in general not very recognizable by Turkic native speakers (Navracsics, 2016, p. 15). For that reason, this distance may seem short at first glance. However, it should be noted that the common Turkic languages (all Turkic languages today, except Chuvash) are highly distant from the Oghur branch and mutual intelligibility is quite limited. It can possibly be expected for Chuvash speakers (as the only extant member of the Oghur branch) to distinguish the Turkic material in Hungarian much more successfully to a certain extent that is close to the results of this work, but of course, this hypothesis begs for further investigation and research. One consideration that is important at this stage is the degree of relevance the source languages, from which Hungarian borrowed the words, had with modern-day Chuvash. Three dialects of WOT from the 10th to 13th centuries were reconstructed, two being extinct and one being Middle Chuvash, but what concerns the Hungarian interaction of the process more was apparently before the 10th century. For what is known before that period about the Chuvash-type languages such as Khazar, Saragur, Onogur, and Volga-Bulgar, the strongest source already is the loanwords in Hungarian (Agyagási, 2019).

In the sprachbund of the Eurasian steppes, Turkic and Hungarian speakers were not the only ones, needless to say. Iranian speakers such as Alans, Germanic speakers such as Goths, and Slavonic speakers co-existed with the former two in different periods. Doubtlessly, the interactions with these groups must have affected the loan phonology of Hungarian borrowings. In this regard, a versatile approach to adaptations instead of a single-ended one could bring a better understanding. Stachowski brings up this issue, criticizing the work of Róna Tas & Berta (2011), and suggests a comparison of phonetic adaptation processes of Turkic loanwords in Hungarian with those of Pannonian Slavonic (Stachowski, 2014, p. 221).

The adaptation rates for each pair are displayed in Table 10. Hungarian words, reconstructed WOT words, phonetic transcriptions of both, and English translations are presented in each section of the list. On the bottom lines, operation costs, the number of phonemic alignments, and the distance rates are given. Penalty costs on pairs are shown in **bold red**. WOT words that have a debated Turkic origin are marked with asterisks.

Table 10: Adaptation rates of WOT loanwords in Hungarian

| | | | | | |
|--|---------------------|-----------|------------------------|------------------|----------|
| Carpenter | | | cannon, catapult | | |
| H. <i>ács</i> | [a: - - tʃ̥ -] | | H. <i>ágyú</i> | [a: - ɟu: -] | |
| WOT. <i>ağaççı</i> | [a ɣ a tʃ̥: i̯] | | WOT. <i>aldağ</i> | [a ɟ d a ɣ] | |
| Cost 3.16 | N-align 5 | LD% 63.2 | Cost 3.16 | N-align 5 | LD% 63.2 |
| to fondle, pet, caress | | | false, imitation | | |
| H. <i>ajnároz</i> | [ɒ j n a: r o z] | | H. <i>ál</i> | [a: l] | |
| WOT. <i>ayan*</i> | [a j a n - - -] | | WOT. <i>al</i> | [a ɟ] | |
| Cost 4.66 | N-align 7 | LD% 66.57 | Cost 0.66 | N-align 2 | LD% 33 |
| pied (of an animals' coat) | | | apple | | |
| H. <i>alacs</i> | [ɒ l ɒ tʃ̥ -] | | H. <i>alma</i> | [ɒ l m ɒ] | |
| WOT. <i>alaç*</i> | [a ɟ a tʃ̥: i̯] | | WOT. <i>alma</i> | [a ɟ m a] | |
| Cost 2 | N-align 5 | LD% 40 | Cost 1 | N-align 4 | LD% 25 |
| barrel(wooden container and standard quantity) | | | to nurse, take care of | | |
| H. <i>általag</i> | [a: l t ɒ l ɒ g] | | H. <i>ápol</i> | [a: p ɒ l] | |
| WOT. <i>altılg*</i> | [a ɟ t i̯ ɟ i̯ g] | | WOT. <i>op*</i> | [ɒ p - -] | |
| Cost 2.32 | N-align 7 | LD% 33.14 | Cost 3 | N-align 4 | LD% 75 |
| to decay, putrify, turn stale | | | small, tiny | | |
| H. <i>áporod(ik)</i> | [a: p ɒ r ɒ d] | | H. <i>apró</i> | [ɒ p - r ɒ: -] | |
| WOT. <i>opura*</i> | [ɒ p u r a -] | | WOT. <i>opuruğ</i> | [ɒ p u r u ɣ] | |

| | | | | | |
|----------------------|---|-----------|---------------------|---|-----------|
| Cost 3 | N-align 6 | LD% 50 | Cost 2.49 | N-align 6 | LD% 41.5 |
| | to mow | | | to decay, go bad (of food, water) | |
| H. <i>arat</i> | [o r o t] | | H. <i>ár(ik)</i> | [a : r] | |
| WOT. <i>orat</i> | [o r a t] | | WOT. <i>ar*</i> | [a r] | |
| Cost 0.66 | N-align 4 | LD% 16.5 | Cost 0.33 | N-align 2 | LD% 16.5 |
| | ditch, canal | | | barley | |
| H. <i>árok</i> | [a : r o k] | | H. <i>árpa</i> | [a : r p o] | |
| WOT. <i>aruk</i> | [a r u k] | | WOT. <i>arpa</i> | [a r p a] | |
| Cost 0.66 | N-align 4 | LD% 16.5 | Cost 0.66 | N-align 4 | LD% 16.5 |
| | Barrow | | | gantry, gantry (for supporting barrels) | |
| H. <i>ártány</i> | [a : r - t a : p] | | H. <i>ászok</i> | [a : s o k] | |
| WOT. <i>artan</i> | [a r ī t a n] | | WOT. <i>aski</i> | [a s k ī] | |
| Cost 2.33 | N-align 6 | LD% 38.83 | Cost 2 | N-align 4 | LD% 50 |
| | Charm | | | soggy place, moor, swamp, marsh | |
| H. <i>báj</i> | [b a : j] | | H. <i>balkány</i> | [b o l k a : p] | |
| WOT. <i>bay*</i> | [b a j] | | WOT. <i>balkan</i> | [b a t k a n] | |
| Cost 0.33 | N-align 3 | LD% 11 | Cost 1.66 | N-align 6 | LD% 27.67 |
| | hatchet, axe | | | pagan idol, stone or wooden pillar, strong(smb) | |
| H. <i>balta</i> | [b o l t o] | | H. <i>bálvány</i> | [b a : l v a : p] | |
| WOT. <i>balta**</i> | [b a t t a] | | WOT. <i>balvan*</i> | [b a t v a n] | |
| Cost 1 | N-align 5 | LD% 20 | Cost 1.66 | N-align 6 | LD% 27.67 |
| | governor of Croatia (of the southern marches) | | | cattle, livestock | |
| H. <i>bán</i> | [b a : - - n] | | H. <i>barom</i> | [b o r o m] | |
| WOT. <i>bayan</i> | [b a j a n] | | WOT. <i>barum*</i> | [b a r u m] | |
| Cost 1.83 | N-align 5 | LD% 36.6 | Cost 0.66 | N-align 5 | LD% 13.2 |
| | Velvet | | | to fuck | |
| H. <i>bársony</i> | [b a : r f o p] | | H. <i>basz(ik)</i> | [b o s] | |
| WOT. <i>barçun**</i> | [b a r t f u n] | | WOT. <i>bas</i> | [b a s] | |
| Cost 1.83 | N-align 6 | LD% 30.5 | Cost 0.33 | N-align 3 | LD% 11 |
| | courageous, brave, valiant | | | to estimate, to esteem, to appreciate | |
| H. <i>bátor</i> | [b a : - - t o r] | | H. <i>becsil</i> | [b ε t f y l] | |
| WOT. <i>bağatur</i> | [b a y a t u r] | | WOT. <i>biçil*</i> | [b i t f i l] | |
| Cost 2.16 | N-align 7 | LD% 30.86 | Cost 0.66 | N-align 5 | LD% 13.2 |
| | Frog | | | hobble, shackle, leg-iron | |
| H. <i>béka</i> | [b ε : k o] | | H. <i>béklyó</i> | [b ε : k - j o :] | |
| WOT. <i>baka</i> | [b a k a] | | WOT. <i>bikağu</i> | [b i k a y u] | |
| Cost 1.33 | N-align 4 | LD% 33.25 | Cost 3.48 | N-align 6 | LD% 58 |
| | stamp, bond, mark | | | wage, rent | |
| H. <i>bélyeg</i> | [b ε : j ε g] | | H. <i>bér</i> | [b ε : r -] | |
| WOT. <i>bäläg*</i> | [b æ l æ g] | | WOT. <i>berü</i> | [b ε r y] | |
| Cost 2.24 | N-align 5 | LD% 44.8 | Cost 1.33 | N-align 4 | LD% 33.25 |
| | name of a people | | | grain or small globule of precious metal | |
| H. <i>bercel</i> | [b ε r t s ε l] | | H. <i>bertű</i> | [b ε r t y : -] | |
| WOT. <i>bärsil*</i> | [b æ r s i l] | | WOT. <i>bürtiğ</i> | [b y r t i y] | |
| Cost 1.49 | N-align 6 | LD% 24.83 | Cost 1.82 | N-align 6 | LD% 30.33 |
| | a bird of prey | | | Pecheneg, name of a tribe | |
| H. <i>bese</i> | [b ε f ε] | | H. <i>besenyő</i> | [b ε f ε p ø : -] | |
| WOT. <i>bäşä*</i> | [b æ f æ] | | WOT. <i>bäcänäg</i> | [b æ t f æ n æ g] | |
| Cost 0.66 | N-align 4 | LD% 16.5 | Cost 3.83 | N-align 7 | LD% 54.71 |
| | letter (of the alphabet) | | | pocket knife | |
| H. <i>betű</i> | [b ε t y : -] | | H. <i>bicsak</i> | [b i t f o k] | |
| WOT. <i>bitig</i> | [b i t i g] | | WOT. <i>biçak</i> | [b i t f a k] | |
| Cost 2 | N-align 5 | LD% 40 | Cost 0.66 | N-align 5 | LD% 13.2 |

| | | | | | |
|-----------------------|-------------------------|-----------|----------------------------|-----------------------|-----------|
| Bull | | | shackles | | |
| H. <i>bika</i> | [b i k ɒ] | | H. <i>bilincs</i> | [b i l i n t͡ʃ - -] | |
| WOT. <i>bika</i> | [b i̇ k a] | | WOT. <i>bilâçäk</i> | [b i l æ - t͡ʃ æ k] | |
| Cost 0.66 | N-align 4 | LD% 16.5 | Cost 3.33 | N-align 8 | LD% 41.62 |
| Judge | | | to be forgiven | | |
| H. <i>bíró</i> | [b i : r o : -] | | H. <i>bocsán(ik)</i> | [b o - t͡ʃ a : n] | |
| WOT. <i>birug*</i> | [b i̇ r u g] | | WOT. <i>bolçan</i> | [b o t͡ʃ a n] | |
| Cost 2 | N-align 5 | LD% 40 | Cost 1.33 | N-align 6 | LD% 22.17 |
| to forgive | | | knot, bend | | |
| H. <i>bocsát</i> | [b o - t͡ʃ a : t] | | H. <i>bog</i> | [b o g] | |
| WOT. <i>bolçat</i> | [b o t͡ʃ a t] | | WOT. <i>bog*</i> | [b o g] | |
| Cost 1.33 | N-align 6 | LD% 22.17 | Cost 0 | N-align 3 | LD% 0 |
| stack of hay | | | tassel, fringe, tuft, node | | |
| H. <i>boglya</i> | [b o g j ɒ] | | H. <i>bojt</i> | [b o j - t] | |
| WOT. <i>bogul*</i> | [b o g u t] | | WOT. <i>bogut*</i> | [b o g u t] | |
| Cost 2.48 | N-align 5 | LD% 49.6 | Cost 1.91 | N-align 5 | LD% 38.2 |
| Burdock | | | ankle | | |
| H. <i>bojtorján</i> | [b o j t o r j a : n] | | H. <i>boka</i> | [b o k ɒ] | |
| WOT. <i>balturğan</i> | [b a t t u r g a n] | | WOT. <i>baka</i> | [b a k a] | |
| Cost 3.14 | N-align 9 | LD% 34.89 | Cost 1 | N-align 4 | LD% 25 |
| Anthill | | | wine | | |
| H. <i>boly</i> | [b o - - j] | | H. <i>bor</i> | [b o r] | |
| WOT. <i>boğul*</i> | [b o y u t] | | WOT. <i>bor</i> | [b o r] | |
| Cost 2.41 | N-align 5 | LD% 48.2 | Cost 0 | N-align 3 | LD% 0 |
| to cover, to overturn | | | calf | | |
| H. <i>borít</i> | [b o r i : t] | | H. <i>borjú</i> | [b o r - j u :] | |
| WOT. <i>bur</i> | [b u r - -] | | WOT. <i>burağu</i> | [b u r a y u] | |
| Cost 2.33 | N-align 5 | LD% 46.6 | Cost 2.48 | N-align 6 | LD% 41.33 |
| Pepper | | | pea, bean | | |
| H. <i>bors</i> | [b o r f] | | H. <i>borsó</i> | [b o r f o -] | |
| WOT. <i>burç</i> | [b u r t͡ʃ] | | WOT. <i>burçağ</i> | [b u r t͡ʃ a y] | |
| Cost 0.83 | N-align 4 | LD% 20.75 | Cost 2 | N-align 6 | LD% 33.33 |
| badger | | | witch, sorceress | | |
| H. <i>borz</i> | [b o r z -] | | H. <i>boszorkány</i> | [b o s o r k a : p] | |
| WOT. <i>borsı</i> | [b o r s i̇] | | WOT. <i>basarkan</i> | [b a s a r k a n] | |
| Cost 1.5 | N-align 5 | LD% 30 | Cost 2.33 | N-align 8 | LD% 29.12 |
| to annoy | | | stick, cane | | |
| H. <i>bosszant</i> | [b o s : ɒ n t] | | H. <i>bot</i> | [b o t - -] | |
| WOT. <i>busan</i> | [b u s a n -] | | WOT. <i>butğ</i> | [b u t i̇ y] | |
| Cost 2 | N-align 6 | LD% 33.33 | Cost 1.83 | N-align 5 | LD% 36.6 |
| rich, abundant, roomy | | | horsefly, gadfly | | |
| H. <i>bő</i> | [b ø : -] | | H. <i>bögöly</i> | [b ø g ø j - -] | |
| WOT. <i>băğ</i> | [b æ y] | | WOT. <i>bögöläk*</i> | [b ø g ø l æ k] | |
| Cost 1.16 | N-align 3 | LD% 38.67 | Cost 3.24 | N-align 7 | LD% 46.29 |
| fast(ing) | | | wise | | |
| H. <i>böjt</i> | [b ø j t -] | | H. <i>böles</i> | [b ø l - t͡ʃ -] | |
| WOT. <i>büjtä*</i> | [b y j t æ] | | WOT. <i>büğüci</i> | [b y j y t͡ʃ i] | |
| Cost 2.15 | N-align 5 | LD% 43 | Cost 3.9 | N-align 6 | LD% 65 |
| cradle | | | bison | | |
| H. <i>bölcső</i> | [b ø l t͡ʃ ø : -] | | H. <i>bölény</i> | [b ø l e : p] | |
| WOT. <i>belçig</i> | [b e l t͡ʃ i y] | | WOT. <i>bülän</i> | [b y l æ n] | |
| Cost 1.83 | N-align 6 | LD% 30.5 | Cost 1.66 | N-align 5 | LD% 33.2 |
| prison, jail | | | sorrow | | |
| H. <i>börtön</i> | [b ø r t ø n] | | H. <i>bú</i> | [b u : -] | |

| | | | |
|---|----------------------|---|----------------------|
| WOT. <i>bärtän</i> | [b æ r t æ n] | WOT. <i>buğ</i> | [b u ɣ] |
| Cost 1.32 | N-align 6 | LD% 22 | Cost 0.83 |
| | | | N-align 3 |
| | | | LD% 27.67 |
| farewell, indulgence, dedication festival | | Volga Bulgar | |
| H. <i>búcsú</i> | [b u : - tʃ u : -] | H. <i>bular</i> | [b u l ɒ r] |
| WOT. <i>bolçuğ</i> | [b o t tʃ u ɣ] | WOT. <i>bular</i> | [b u t a r] |
| Cost 2.49 | N-align 6 | LD% 41.5 | Cost 0.66 |
| | | | N-align 5 |
| | | | LD% 13.2 |
| steam, vapour, fumes | | wheat | |
| H. <i>búsz</i> | [b u : s] | H. <i>búza</i> | [b u : - z ɒ -] |
| WOT. <i>bús</i> | [b u : s] | WOT. <i>buğday</i> | [b u ɣ ð a j] |
| Cost 0 | N-align 3 | LD% 0 | Cost 1.82 |
| | | | N-align 6 |
| | | | LD% 30.33 |
| beech | | sin | |
| H. <i>bükk</i> | [b y k :] | H. <i>bűn</i> | [b y : n] |
| WOT. <i>bik</i> | [b i k] | WOT. <i>bűn</i> | [b y : n] |
| Cost 0.66 | N-align 3 | LD% 22 | Cost 0 |
| | | | N-align 3 |
| | | | LD% 0 |
| end of sg, a rod with an end cut | | magical | |
| H. <i>bütü</i> | [b y t y -] | H. <i>bűvös</i> | [b y : v ɔ s] |
| WOT. <i>bütüğ</i> | [b y t y ɣ] | WOT. <i>bűgü</i> | [b y ɣ y -] |
| Cost 0.50 | N-align 5 | LD% 10 | Cost 2.33 |
| | | | N-align 5 |
| | | | LD% 46.6 |
| to regret, to be sorry | | feast, christening feast (at baptism) | |
| H. <i>bán(ik)</i> | [b a : - - n] | H. <i>csök</i> | [tʃ ɔ k] |
| WOT. <i>bagın</i> | [b a ɣ ĩ n] | WOT. <i>çök*</i> | [tʃ ɔ k] |
| Cost 2.33 | N-align 5 | LD% 46.6 | Cost 0 |
| | | | N-align 3 |
| | | | LD% 0 |
| a kind of willow | | only, just | |
| H. <i>cigle</i> | [tʃ i ɣ l ɛ] | H. <i>csak</i> | [tʃ ɒ k] |
| WOT. <i>çiglä*</i> | [tʃ i ɣ l æ] | WOT. <i>çak</i> | [tʃ a k] |
| Cost 0.66 | N-align 5 | LD% 13.2 | Cost 0.33 |
| | | | N-align 3 |
| | | | LD% 11 |
| pick-axe, war hammer | | nettle | |
| H. <i>csákány</i> | [tʃ a : k a : ɒ] | H. <i>csalán</i> | [tʃ ɒ l - - a : n] |
| WOT. <i>çakkan</i> | [tʃ a : k a n] | WOT. <i>çalğan</i> | [tʃ a t ɣ a n] |
| Cost 1.66 | N-align 5 | LD% 33.2 | Cost 2.5 |
| | | | N-align 7 |
| | | | LD% 35.71 |
| thicket, brushwood | | (silver) cup, bowl | |
| H. <i>csalít</i> | [tʃ ɒ l i t] | H. <i>csanak</i> | [tʃ ɒ n ɒ k] |
| WOT. <i>çaltı*</i> | [tʃ a t ɨ] | WOT. <i>çanak</i> | [tʃ a n a k] |
| Cost 2 | N-align 5 | LD% 40 | Cost 0.66 |
| | | | N-align 5 |
| | | | LD% 13.2 |
| fighting, troop, battle, quarrel | | to add, to join, to buckle up | |
| H. <i>csata</i> | [tʃ ɒ t ɒ] | H. <i>csatol</i> | [tʃ ɒ t ɒ l] |
| WOT. <i>çata*</i> | [tʃ a t a] | WOT. <i>çatı</i> | [tʃ a t ɨ -] |
| Cost 0.66 | N-align 4 | LD% 16.5 | Cost 2 |
| | | | N-align 5 |
| | | | LD% 40 |
| measle, smallpox, pocks | | to bind (something) | |
| H. <i>csécs</i> | [tʃ e : tʃ - -] | H. <i>csekél</i> | [tʃ ɛ k e : l] |
| WOT. <i>çeçäk</i> | [tʃ e tʃ æ k] | WOT. <i>çik*</i> | [tʃ i k - -] |
| Cost 2.33 | N-align 5 | LD% 46.6 | Cost 2.33 |
| | | | N-align 5 |
| | | | LD% 46.6 |
| impurities, tow, chaff | | snail | |
| H. <i>csöpű</i> | [tʃ ɔ p y : -] | H. <i>csiga</i> | [tʃ i ɣ ɒ] |
| WOT. <i>çöpüğ</i> | [tʃ ɔ p y ɣ] | WOT. <i>çiga*</i> | [tʃ i ɣ a] |
| Cost 0.83 | N-align 5 | LD% 16.6 | Cost 0.66 |
| | | | N-align 4 |
| | | | LD% 16.5 |
| a wine of low quality, a fruit one | | secretion, mucus discharged from the eyes | |
| H. <i>csiger</i> | [tʃ i ɣ ɛ r] | H. <i>csipa</i> | [tʃ i p ɒ -] |
| WOT. <i>çigr*</i> | [tʃ i ɣ ĩ r] | WOT. <i>çapağ</i> | [tʃ a p a ɣ] |
| Cost 0.66 | N-align 5 | LD% 13.2 | Cost 1.5 |
| | | | N-align 5 |
| | | | LD% 30 |
| a carpenter's axe with a long helve | | sexual organ of large male animals | |
| H. <i>csomak</i> | [tʃ ɔ m ɒ k] | H. <i>csök</i> | [tʃ ɔ k] |
| WOT. <i>çomak</i> | [tʃ ɔ m a k] | WOT. <i>çük</i> | [tʃ y k] |

| | | | | | |
|--|----------------|-----------|---|-------------------|-----------|
| Cost 0.33 | N-align 5 | LD% 6.6 | Cost 0.33 | N-align 3 | LD% 11 |
| to become smaller, remain small | | | stubborn | | |
| H. <i>csökik</i> | [tʃø k i k] | | H. <i>csökönyös</i> | [tʃø k ø n j ø f] | |
| WOT. <i>çök</i> | [tʃø k --] | | WOT. <i>çikin*</i> | [tʃi k i n ---] | |
| Cost 2 | N-align 5 | LD% 40 | Cost 4.32 | N-align 8 | LD% 54 |
| field-guard | | | rough, coarse, ugly | | |
| H. <i>csősz</i> | [tʃø: - - s] | | H. <i>csúnya</i> | [tʃu: p ø -] | |
| WOT. <i>çäwiş</i> | [tʃæ w i f] | | WOT. <i>çunağ</i> | [tʃu n a y] | |
| Cost 2.83 | N-align 5 | LD% 56.6 | Cost 1.83 | N-align 5 | LD% 36.6 |
| to wind, to turn, to distort, misinterpret | | | grist, groats, soft hail | | |
| H. <i>csűr</i> | [tʃ - - y: r] | | H. <i>dara</i> | [d ø r ø] | |
| WOT. <i>çäwür</i> | [tʃæ w y r] | | WOT. <i>tari</i> | [t a r i] | |
| Cost 1.83 | N-align 5 | LD% 36.6 | Cost 1.5 | N-align 4 | LD% 37.5 |
| noon, south | | | nut, walnut | | |
| H. <i>dél</i> | [d e: l -] | | H. <i>dió</i> | [di - o: -] | |
| WOT. <i>tüli</i> | [t y l i] | | WOT. <i>yığağ</i> | [j i y a y] | |
| Cost 2 | N-align 4 | LD% 50 | Cost 3.9 | N-align 5 | LD% 78 |
| pig | | | to lean, topple over, stream down | | |
| H. <i>disznó</i> | [di s n o: -] | | H. <i>dől</i> | [d ø l] | |
| WOT. <i>yasnağ</i> | [ja s n a y] | | WOT. <i>tül</i> | [t y l] | |
| Cost 3.73 | N-align 6 | LD% 62.17 | Cost 0.83 | N-align 3 | LD% 27.67 |
| to squeeze, to thrust into | | | church (building and organization) | | |
| H. <i>dug</i> | [d u g] | | H. <i>egyház</i> | [ɛ j - h a: z] | |
| WOT. <i>dıg*</i> | [d i g] | | WOT. <i>edü</i> | [e d y - -] | |
| Cost 0.33 | N-align 3 | LD% 11 | Cost 4.66 | N-align 6 | LD% 77.67 |
| wedge | | | plough | | |
| H. <i>ék</i> | [e: k] | | H. <i>eke</i> | [ɛ k ɛ -] | |
| WOT. <i>ék*</i> | [e: k] | | WOT. <i>äkäğ</i> | [æ k æ y] | |
| Cost 0 | N-align 2 | LD% 0 | Cost 1.16 | N-align 4 | LD% 29 |
| to allow, permit, concede, yield, give way | | | community work in agriculture | | |
| H. <i>enged</i> | [ɛ n g ɛ d] | | H. <i>enő</i> | [ɛ n ø: -] | |
| WOT. <i>än</i> | [æ ŋ - - -] | | WOT. <i>inäg</i> | [i n æ y] | |
| Cost 4 | N-align 5 | LD% 80 | Cost 1.83 | N-align 4 | LD% 45.75 |
| to arrive, to reach, get to | | | merit | | |
| H. <i>ér</i> | [e: r] | | H. <i>érdem</i> | [e: r d ɛ m] | |
| WOT. <i>er**</i> | [e r] | | WOT. <i>ärdäm</i> | [æ r d æ m] | |
| Cost 0.33 | N-align 2 | LD% 16.5 | Cost 1 | N-align 5 | LD% 20 |
| morals, morality | | | to tire, lose vitality, slacken, relax | | |
| H. <i>erkölcs</i> | [ɛ r k ø l tʃ] | | H. <i>ernyed</i> | [ɛ r - p ɛ d] | |
| WOT. <i>ärkilç*</i> | [æ r k i l tʃ] | | WOT. <i>ärin</i> | [æ r i n - -] | |
| Cost 1 | N-align 6 | LD% 16.67 | Cost 4 | N-align 6 | LD% 66.67 |
| strength, power | | | oath | | |
| H. <i>erő</i> | [ɛ r ø: -] | | H. <i>es</i> | [ɛ f - -] | |
| WOT. <i>äriğ</i> | [æ r i y] | | WOT. <i>içkü*</i> | [i tʃ k y] | |
| Cost 1.83 | N-align 4 | LD% 45.75 | Cost 2.83 | N-align 4 | LD% 70.75 |
| reason, mind | | | river, name of a river | | |
| H. <i>ész</i> | [e: s] | | H. <i>etel</i> | [ɛ t ɛ l] | |
| WOT. <i>es</i> | [e s] | | WOT. <i>ätıl</i> | [æ t i l] | |
| Cost 0.33 | N-align 2 | LD% 16.5 | Cost 0.66 | N-align 4 | LD% 16.5 |
| weed | | | polecat | | |
| H. <i>gaz</i> | [g ø - z -] | | H. <i>görény</i> | [g ø r e: p] | |
| WOT. <i>kağdu*</i> | [k a y ð u] | | WOT. <i>gürän</i> | [g y r æ n] | |
| Cost 2.66 | N-align 5 | LD% 53.2 | Cost 1.66 | N-align 5 | LD% 33.2 |
| pelican | | | a kind of tree similar to the maple or cornel | | |

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|---|--------------------|--|-------------------|
| H. <i>gödény</i> | [g o d e: n] | H. <i>gyűrű</i> | [j y: r y: -] |
| WOT. <i>güdan*</i> | [g y d æ n] | WOT. <i>yereğ</i> | [j e r e y] |
| Cost 1.66 | N-align 5 | LD% 33.2 | Cost 3.75 |
| gleaner mouse | | to abuse, calumniate | |
| H. <i>güzü</i> | [g y z - - y] | H. <i>gyaláz</i> | [j o l a: z] |
| WOT. <i>küsägü*</i> | [k y s æ y y] | WOT. <i>yala</i> | [j a t a -] |
| Cost 2.66 | N-align 6 | LD% 44.33 | Cost 3.25 |
| drag-net, a kind of fishing net | | suspicion, mistrust | |
| H. <i>gyalom</i> | [j o l o m] | H. <i>gyanú</i> | [j o n u: -] |
| WOT. <i>yalm</i> | [j a t i m] | WOT. <i>yonağ</i> | [j o n a y] |
| Cost 2.25 | N-align 5 | LD% 45 | Cost 3.08 |
| wool | | cotton | |
| H. <i>gyapjú</i> | [j o p - j u:] | H. <i>gyapot</i> | [j o p o t] |
| WOT. <i>yapağu</i> | [j a p a y u] | WOT. <i>yaput</i> | [j a p u t] |
| Cost 3.57 | N-align 6 | LD% 59.5 | Cost 1.91 |
| to increase, to put on weight, to grow stronger | | poor, frail, feeble | |
| H. <i>gyarapod(ik)</i> | [j o r p o d] | H. <i>gyarló</i> | [j o r l o: -] |
| WOT. <i>yarpa</i> | [j a r p a - -] | WOT. <i>yarlığ</i> | [j a r t i y] |
| Cost 4.58 | N-align 7 | LD% 65.43 | Cost 3.41 |
| to produce, build, fabricate | | mourning, bereavement | |
| H. <i>gyárt</i> | [j a: r - t] | H. <i>gyász</i> | [j a: s] |
| WOT. <i>yarat</i> | [j a r a t] | WOT. <i>yas</i> | [j a s] |
| Cost 2.58 | N-align 5 | LD% 51.6 | Cost 1.57 |
| bulrush | | weak, feeble | |
| H. <i>gyékény</i> | [j e: k e: n] | H. <i>gyenge</i> | [j e n g e] |
| WOT. <i>yekän</i> | [j e k æ n] | WOT. <i>yeni*</i> | [j e n - i] |
| Cost 2.9 | N-align 5 | LD% 58 | Cost 3.58 |
| rein | | borderland, hedge | |
| H. <i>gyeplő</i> | [j e p l o: -] | H. <i>gyepű</i> | [j e p y: -] |
| WOT. <i>yipliğ</i> | [j i p l i y] | WOT. <i>yäpiğ*</i> | [j ä p i y] |
| Cost 3.08 | N-align 6 | LD% 51.33 | Cost 2.74 |
| child | | candle | |
| H. <i>gyermek</i> | [j e r m e k] | H. <i>gyertya</i> | [j e r e p] |
| WOT. <i>yärmäk*</i> | [j æ r m æ k] | WOT. <i>yarta</i> | [j a r t a] |
| Cost 1.91 | N-align 6 | LD% 31.83 | Cost 2.9 |
| hornbeam | | murder, killer | |
| H. <i>gyertyán</i> | [j e r e a: - - n] | H. <i>gyilkos</i> | [j i l k o f -] |
| WOT. <i>yartağan</i> | [j a r t a y a n] | WOT. <i>yulkuçi*</i> | [j u t k u t f i] |
| Cost 4.4 | N-align 8 | LD% 55 | Cost 4.07 |
| weed | | stomach | |
| H. <i>gyom</i> | [j o m] | H. <i>gyomor</i> | [j o m o r] |
| WOT. <i>yom</i> | [j o m] | WOT. <i>yumur</i> | [j u m u r] |
| Cost 1.25 | N-align 3 | LD% 41.67 | Cost 1.91 |
| to confess (sins) | | cudweed | |
| H. <i>gyón(ik)</i> | [j o: n] | H. <i>gyopár</i> | [j o p a: r] |
| WOT. <i>yun</i> | [j u n] | WOT. <i>yıpar</i> | [j i p a r] |
| Cost 1.91 | N-align 3 | LD% 63.67 | Cost 2.25 |
| pearl | | to torture, to make suffer | |
| H. <i>gyöngy</i> | [j o n j -] | H. <i>gyötör</i> | [j o t o r] |
| WOT. <i>yinyü</i> | [j i n j y] | WOT. <i>yitür</i> | [j i t y r] |
| Cost 4.16 | N-align 5 | LD% 83.2 | Cost 2.25 |
| to conquer, triumph, gain victory | | to catch fire, be kindled, to be ignited | |
| H. <i>győz</i> | [j o: - - z] | H. <i>gyúl</i> | [j u: l] |

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| WOT. <i>yägüz</i> * | [jæyz] | | WOT. <i>yul</i> * | [juł] | |
| Cost 3.75 | N-align 5 | LD% 75 | Cost 1.91 | N-align 3 | LD% 63.67 |
| | to knead, pug | | | assemble, gather | |
| H. <i>gyúr</i> | [ju:--r] | | H. <i>gyúl(ik)</i> | [jy:--l] | |
| WOT. <i>yuğur</i> | [juɣur] | | WOT. <i>yiğil</i> | [jiyil] | |
| Cost 3.08 | N-align 5 | LD% 61.6 | Cost 3.41 | N-align 5 | LD% 68.2 |
| | to hate | | | fruit | |
| H. <i>gyülöl</i> | [jy:--løl] | | H. <i>gyümölcs</i> | [jymøltʃ] | |
| WOT. <i>yagilä</i> | [jagilæ-] | | WOT. <i>yemilç</i> | [jemif] | |
| Cost 5.91 | N-align 7 | LD% 84.43 | Cost 4.07 | N-align 6 | LD% 67.83 |
| | hawthorn, a plant similar to the whitethorn | | | ring | |
| H. <i>gyümölcsény</i> | [jymøltʃe:p] | | H. <i>gyűrű</i> | [jy:ry:-] | |
| WOT. <i>yemilçen</i> | [jemifən] | | WOT. <i>yürüğ</i> | [jyryy] | |
| Cost 5.07 | N-align 8 | LD% 63.37 | Cost 2.41 | N-align 5 | LD% 48.2 |
| | thimble | | | boat, ship | |
| H. <i>gyűszű</i> | [jy:-sy:-] | | H. <i>hajó</i> | [hnjo:-] | |
| WOT. <i>yüğsüğ</i> | [jyyyy] | | WOT. <i>hayığ</i> | [χajıy] | |
| Cost 2.91 | N-align 6 | LD% 48.5 | Cost 2.5 | N-align 5 | LD% 50 |
| | bell | | | hawk | |
| H. <i>harang</i> | [hɔrɔng] | | H. <i>herjó</i> | [hɛrjo:-] | |
| WOT. <i>honar</i> | [χɔnar-] | | WOT. <i>hurğuy</i> | [χiryuj] | |
| Cost 4 | N-align 6 | LD% 66.67 | Cost 3.16 | N-align 6 | LD% 52.67 |
| | sand | | | noose, loop, snare | |
| H. <i>homok</i> | [homok-] | | H. <i>hurok</i> | [hurok] | |
| WOT. <i>humakı</i> | [χumakı] | | WOT. <i>urok</i> | [-urok] | |
| Cost 2.66 | N-align 6 | LD% 44.33 | Cost 1 | N-align 5 | LD% 20 |
| | time, weather | | | yes, affirmative particle, very | |
| H. <i>idő</i> | [idø:-] | | H. <i>igen</i> | [igɛn] | |
| WOT. <i>üdağ</i> | [ydaɣ] | | WOT. <i>ärkän</i> * | [ærkæn] | |
| Cost 2.16 | N-align 4 | LD% 54 | Cost 2.33 | N-align 5 | LD% 46.6 |
| | to frighten | | | twin | |
| H. <i>ijeszt</i> | [ijɛst] | | H. <i>iker</i> | [ikɛr] | |
| WOT. <i>äyi</i> * | [æji--] | | WOT. <i>ikir</i> | [ikir] | |
| Cost 2.66 | N-align 5 | LD% 53.2 | Cost 0.33 | N-align 4 | LD% 8.25 |
| | proper behaviour | | | to suit something, to be proper, to fit into | |
| H. <i>ildom</i> | [ildom] | | H. <i>ill(ik)</i> | [il:] | |
| WOT. <i>ildam</i> | [ıłdam] | | WOT. <i>il</i> | [il] | |
| Cost 1.33 | N-align 5 | LD% 26.6 | Cost 0.33 | N-align 2 | LD% 16.5 |
| | to adore, worship | | | shirt | |
| H. <i>imád</i> | [-imad] | | H. <i>ing</i> | [in--g] | |
| WOT. <i>vim</i> * | [vīm--] | | WOT. <i>önmək</i> * | [ønmaek] | |
| Cost 3.33 | N-align 5 | LD% 66.6 | Cost 4 | N-align 5 | LD% 80 |
| | to write | | | buttermilk | |
| H. <i>ír</i> | [ir] | | H. <i>író</i> | [irø:-] | |
| WOT. <i>ır</i> | [ır] | | WOT. <i>ırağ</i> | [ıray] | |
| Cost 0.33 | N-align 2 | LD% 16.5 | Cost 2.16 | N-align 4 | LD% 54 |
| | to glow, be hot | | | name of an Iranian ethnic group in Hungary | |
| H. <i>izzik</i> | [izik] | | H. <i>jász</i> | [jas] | |
| WOT. <i>isi</i> * | [isĩ-] | | WOT. <i>yas</i> | [jas] | |
| Cost 2.49 | N-align 4 | LD% 62.25 | Cost 0 | N-align 3 | LD% 0 |
| | bulrush, club-rush | | | a muslim ethnic group in medieval Hungary | |
| H. <i>káka</i> | [kakkɔ] | | H. <i>káliz</i> | [k-a:liz] | |
| WOT. <i>kakı</i> | [kakı] | | WOT. <i>kvaliz</i> | [kvaliz] | |
| Cost 1 | N-align 4 | LD% 25 | Cost 1.33 | N-align 6 | LD% 22.17 |

| | | | | | |
|--|--|-----------|---|---|-----------|
| a water plant | | | bridle, reins | | |
| H. <i>kalokány</i> | [k p - l o k a : p] | | H. <i>kantár</i> | [k p n t a : r] | |
| WOT. <i>karlukan</i> | [k a r l u k a n] | | WOT. <i>kantar</i> | [k a n t a r] | |
| Cost 3 | N-align 8 | LD% 37.5 | Cost 0.66 | N-align 6 | LD% 11 |
| measles | | | trap, snare | | |
| H. <i>kanyaró</i> | [k p p r o : -] | | H. <i>kaptány</i> | [k p p k a : p] | |
| WOT. <i>karamuğ</i> | [k a r a m u y] | | WOT. <i>kapkan</i> | [k a p k a n] | |
| Cost 4.14 | N-align 7 | LD% 59.14 | Cost 1.33 | N-align 6 | LD% 22.17 |
| gate | | | arm | | |
| H. <i>kapu</i> | [k p u -] | | H. <i>kar</i> | [k p r] | |
| WOT. <i>kapuğ</i> | [k a p u y] | | WOT. <i>kar</i> | [k a r] | |
| Cost 0.83 | N-align 5 | LD% 16.6 | Cost 0.33 | N-align 3 | LD% 11 |
| damage, loss | | | man of grit, stout fellow | | |
| H. <i>kár</i> | [k a : r] | | H. <i>karakán</i> | [k p r p k a : n] | |
| WOT. <i>kor</i> | [k o : r] | | WOT. <i>karakán</i> | [k a r a k a n] | |
| Cost 0.66 | N-align 3 | LD% 22 | Cost 1 | N-align 7 | LD% 14.29 |
| sheepfold, cattlegrid, stockyard | | | stake, pale, stick | | |
| H. <i>karám</i> | [k p r a : m] | | H. <i>karó</i> | [k p r o : -] | |
| WOT. <i>koram</i> | [k o r a m] | | WOT. <i>karóğ</i> | [k a r o y] | |
| Cost 0.66 | N-align 5 | LD% 13.2 | Cost 1.16 | N-align 5 | LD% 23.2 |
| a fishing water bird with black feathers | | | sparrow hawk | | |
| H. <i>kárókatona</i> | [k a : r o : k p t o n p] | | H. <i>karvaly</i> | [k p r v p j] | |
| WOT. <i>kara kotan*</i> | [k a r a k o t a n -] | | WOT. <i>kargay*</i> | [k a r g a j] | |
| Cost 3.33 | N-align 10 | LD% 33.33 | Cost 1.57 | N-align 6 | LD% 26.17 |
| chicory | | | an ethnic name, Kazar | | |
| H. <i>katáng</i> | [k p t a : n g] | | H. <i>kazár</i> | [k p z a : r] | |
| WOT. <i>katan</i> | [k a t a n -] | | WOT. <i>kazar</i> | [k a z a r] | |
| Cost 2.33 | N-align 6 | LD% 38.83 | Cost 0.66 | N-align 5 | LD% 13.2 |
| bosom, breast | | | goat | | |
| H. <i>kebel</i> | [k ε b ε l] | | H. <i>kecske</i> | [k ε t̃ - k ε] | |
| WOT. <i>käbäl*</i> | [k æ b æ l] | | WOT. <i>käçäkä</i> | [k æ t̃ æ k æ] | |
| Cost 0.66 | N-align 5 | LD% 13.2 | Cost 1.66 | N-align 6 | LD% 27.67 |
| blue | | | trousseau, dowry, gift given with the bride | | |
| H. <i>kék</i> | [k ε : k] | | H. <i>kelengye</i> | [k ε l ε n l ε -] | |
| WOT. <i>kök</i> | [k ø : k] | | WOT. <i>kälinçäğ</i> | [k æ l æ n t̃ æ y] | |
| Cost 0.33 | N-align 3 | LD% 11 | Cost 2.58 | N-align 8 | LD% 32.25 |
| hemp | | | mercury | | |
| H. <i>kender</i> | [k ε n d ε r] | | H. <i>kéneső</i> | [k ε : n ε l ø :] | |
| WOT. <i>kändir</i> | [k æ n d i r] | | WOT. <i>kenä şu</i> | [k ε n æ l u :] | |
| Cost 0.66 | N-align 6 | LD% 11 | Cost 1.33 | N-align 6 | LD% 22.17 |
| picture, shape, form | | | shock, shook, sheaves placed crosswise | | |
| H. <i>kép</i> | [k ε : p] | | H. <i>kepe</i> | [k ε p ε -] | |
| WOT. <i>käp</i> | [k æ : p] | | WOT. <i>käpäğ*</i> | [k æ p æ y] | |
| Cost 0.33 | N-align 3 | LD% 11 | Cost 1.16 | N-align 5 | LD% 23.2 |
| a kind of ship | | | to ruminate (of bovines) | | |
| H. <i>kerép</i> | [k ε r ε p] | | H. <i>kérődz(ik)</i> | [k ε : r ø : d z] | |
| WOT. <i>käräp</i> | [k æ r æ p] | | WOT. <i>käwir</i> | [k æ w i - r] | |
| Cost 0.66 | N-align 5 | LD% 13.2 | Cost 3.83 | N-align 6 | LD% 63.83 |
| garden, place for animals | | | vulture | | |
| H. <i>kert</i> | [k ε r t -] | | H. <i>keselyű</i> | [k ε l ε j y : -] | |
| WOT. <i>kärtä*</i> | [k æ r t æ] | | WOT. <i>küçäläg*</i> | [k y t̃ æ l æ y] | |
| Cost 1.33 | N-align 5 | LD% 26.6 | Cost 4.25 | N-align 7 | LD% 60.71 |
| to be, become late | | | small, little | | |

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|--|----------------------|-----------|--|-------------------------|-----------|
| H. <i>kés(ik)</i> | [k e : f] | | H. <i>kicsiny</i> | [k i tʃi n̄] | |
| WOT. <i>keç</i> | [k e : tʃ] | | WOT. <i>kiçin</i> | [k i tʃi n̄] | |
| Cost 0.5 | N-align 3 | LD% 16.67 | Cost 0.66 | N-align 5 | LD% 13.2 |
| wild/ meadow saffron, lion's tooth | | | a bird similar to a falcon | | |
| H. <i>kikerics</i> | [k i k e r i - tʃ] | | H. <i>kiköcsén</i> | [k i k ø - tʃ e : n̄] | |
| WOT. <i>kökärilç</i> | [k ø k æ r i l tʃ] | | WOT. <i>kökärçän</i> | [k ø k æ r tʃ æ n̄] | |
| Cost 2 | N-align 8 | LD% 25 | Cost 3 | N-align 8 | LD% 37.5 |
| pain | | | to beg, to mendicate | | |
| H. <i>kín</i> | [k i : n̄] | | H. <i>koldul</i> | [k o l d u l] | |
| WOT. <i>kin</i> | [k i : n̄] | | WOT. <i>koldu</i> | [k o l d u -] | |
| Cost 0 | N-align 3 | LD% 0 | Cost 1.33 | N-align 6 | LD% 22.17 |
| hops, <i>humulus lupulus</i> | | | timothy-grass, phleum | | |
| H. <i>komló</i> | [k o m l o : -] | | H. <i>komócsin</i> | [k o m ø : tʃi n̄] | |
| WOT. <i>kumlağ</i> | [k u m l a y] | | WOT. <i>kamıçın</i> | [k a m i tʃi n̄] | |
| Cost 1.16 | N-align 6 | LD% 19.33 | Cost 2 | N-align 7 | LD% 28.57 |
| gloomy, grave, morose, somber, dull-coloured | | | coffin | | |
| H. <i>komor</i> | [k o m ø r] | | H. <i>koporsó</i> | [k o p ø r f o : -] | |
| WOT. <i>komur</i> | [k o m ø r] | | WOT. <i>kapurçağ</i> | [k a p ø r tʃ a y] | |
| Cost 0.33 | N-align 5 | LD% 6.6 | Cost 3 | N-align 8 | LD% 37.5 |
| age, period | | | tomb, small hill, elevated, dry place in a marsh | | |
| H. <i>kor</i> | [k ø r] | | H. <i>korhány</i> | [k ø r h a : p] | |
| WOT. <i>kur</i> | [k ø r] | | WOT. <i>korğan</i> | [k ø r y a n̄] | |
| Cost 0.33 | N-align 3 | LD% 11 | Cost 2.66 | N-align 6 | LD% 44.33 |
| dry stalk of weed | | | soot | | |
| H. <i>kóró</i> | [k ø : - r ø : -] | | H. <i>korom</i> | [k ø r ø m] | |
| WOT. <i>kowrog*</i> | [k ø w r ø g] | | WOT. <i>kurum</i> | [k ø r ø m] | |
| Cost 2.16 | N-align 6 | LD% 36 | Cost 0.66 | N-align 5 | LD% 13.2 |
| ram | | | burn | | |
| H. <i>kos</i> | [k ø f] | | H. <i>kozma</i> | [k ø z m ø -] | |
| WOT. <i>koç</i> | [k ø tʃ] | | WOT. <i>kasmağ</i> | [k a s m a y] | |
| Cost 0.5 | N-align 3 | LD% 16.67 | Cost 2 | N-align 6 | LD% 33.33 |
| frock, sheepskin waistcoat | | | blackthorn | | |
| H. <i>ködmön</i> | [k ø d m ø n̄] | | H. <i>kökény</i> | [k ø k e : p] | |
| WOT. <i>kädmän</i> | [k æ d m æ n̄] | | WOT. <i>kökän</i> | [k ø k æ n̄] | |
| Cost 1.33 | N-align 6 | LD% 22.17 | Cost 1.33 | N-align 5 | LD% 26.6 |
| loan | | | navel, various parts of agricultural instruments | | |
| H. <i>kölcsön</i> | [k ø l tʃ ø n̄] | | H. <i>köldök</i> | [k ø l d ø k] | |
| WOT. <i>kölçen</i> | [k ø l tʃ e n̄] | | WOT. <i>kindik</i> | [k i n d i k] | |
| Cost 0.33 | N-align 6 | LD% 5.5 | Cost 2.07 | N-align 6 | LD% 34.5 |
| young of an animal, kid, puppy, lad | | | pounder, beater, small mortar | | |
| H. <i>kölyök</i> | [k ø j ø k] | | H. <i>kölyú</i> | [k ø j y : -] | |
| WOT. <i>köläk</i> | [k ø l æ k] | | WOT. <i>keliğ</i> | [k e l i y] | |
| Cost 1.91 | N-align 5 | LD% 38.2 | Cost 2.74 | N-align 5 | LD% 54.8 |
| book | | | stumpy, a small and thick man | | |
| H. <i>könyv</i> | [k ø p - v] | | H. <i>köpcös</i> | [k ø p t s ø f] | |
| WOT. <i>künüğ*</i> | [k ø p y y] | | WOT. <i>köpçäg*</i> | [k ø p tʃ æ y] | |
| Cost 2 | N-align 5 | LD% 40 | Cost 2.15 | N-align 6 | LD% 35.83 |
| a kind of Hungarian sheepdog | | | cloak, gown, overcoat | | |
| H. <i>köpec</i> | [k ø p e tʃ] | | H. <i>köpönyeg</i> | [k ø p ø p e g] | |
| WOT. <i>köpäk*</i> | [k ø p æ k] | | WOT. <i>kepenek</i> | [k e p e n e k] | |
| Cost 1.24 | N-align 5 | LD% 24.8 | Cost 2.33 | N-align 7 | LD% 33.29 |
| churn, beehive | | | ash tree | | |
| H. <i>köpü</i> | [k ø p y : -] | | H. <i>kőris</i> | [k ø : - r i f] | |
| WOT. <i>küpüğ</i> | [k ø p y y] | | WOT. <i>kevríč</i> | [k e v r i tʃ] | |

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| Cost 1.16 | N-align 5 | LD% 23.2 | Cost 2.16 | N-align 6 | LD% 36 |
| mellow, powdery, crumbly, rotten, mouldy | | | pear | | |
| H. <i>kőrő</i> | [k ø: - r ø: -] | | H. <i>körtvély</i> | [k ø r t v e: - - j] | |
| WOT. <i>kävrağ</i> | [k æ v r æ y] | | WOT. <i>kertmeliğ</i> | [k e r t m e l i y] | |
| Cost 3.5 | N-align 6 | LD% 58.33 | Cost 4.31 | N-align 9 | LD% 47.89 |
| to greet, to thank | | | Cuman ethnic group in Hungary | | |
| H. <i>köszön</i> | [k ø s ø n] | | H. <i>kun</i> | [k u - - n] | |
| WOT. <i>küsän</i> | [k y s æ n] | | WOT. <i>kuwan</i> | [k u w a n] | |
| Cost 1 | N-align 5 | LD% 20 | Cost 1.5 | N-align 5 | LD% 30 |
| laughing bird | | | chaff, husks, winnowing, tailings | | |
| H. <i>küllő</i> | [k y l: ø: - - -] | | H. <i>ocsú</i> | [o tʃ u: -] | |
| WOT. <i>külüläğ*</i> | [k y l y l æ y] | | WOT. <i>uçoğ</i> | [u tʃ o y] | |
| Cost 4 | N-align 7 | LD% 57.14 | Cost 1.5 | N-align 4 | LD% 37.5 |
| cause, reason | | | sty, cattle pen, sheepfold | | |
| H. <i>ok</i> | [o k] | | H. <i>ól</i> | [o: - - l] | |
| WOT. <i>uk</i> | [u k] | | WOT. <i>ağul</i> | [a y u t] | |
| Cost 0.33 | N-align 2 | LD% 16.5 | Cost 2.83 | N-align 4 | LD% 70.75 |
| a fish living at the bottom of the river, gudgeon | | | spoke (of a wheel) | | |
| H. <i>küllő</i> | [k y l: ø: - - - - -] | | H. <i>küllő</i> | [k y l: ø: -] | |
| WOT. <i>köligäliğ*</i> | [k ø l i g æ l i y] | | WOT. <i>küväy*</i> | [k y v a j] | |
| Cost 6.66 | N-align 9 | LD% 74 | Cost 3 | N-align 5 | LD% 60 |
| cheap | | | kid (of a goat) | | |
| H. <i>olcsó</i> | [o l tʃ o: -] | | H. <i>olló</i> | [o - l: o: -] | |
| WOT. <i>uçaç</i> | [u - tʃ a y] | | WOT. <i>oğlağ</i> | [o y t a y] | |
| Cost 2.83 | N-align 5 | LD% 56.6 | Cost 2.66 | N-align 5 | LD% 53.2 |
| sperm, seminal fluid | | | Russian | | |
| H. <i>ondó</i> | [o n d o: -] | | H. <i>orosz</i> | [o r o s] | |
| WOT. <i>undağ</i> | [u n d a y] | | WOT. <i>urus</i> | [u r u s] | |
| Cost 1.83 | N-align 5 | LD% 36.6 | Cost 0.66 | N-align 4 | LD% 16.5 |
| lion | | | spindle, whorl | | |
| H. <i>oroszlán</i> | [o r o s l a: n] | | H. <i>orsó</i> | [o r f o: -] | |
| WOT. <i>aruslan</i> | [a r u s t a n] | | WOT. <i>urçuğ</i> | [u r tʃ u y] | |
| Cost 1.66 | N-align 7 | LD% 23.71 | Cost 2 | N-align 5 | LD% 40 |
| thief | | | physician | | |
| H. <i>orv</i> | [o - r v] | | H. <i>orvos</i> | [o r v o f -] | |
| WOT. <i>ogru</i> | [o g r u] | | WOT. <i>orwuç*</i> | [o r w u tʃ i] | |
| Cost 2.33 | N-align 4 | LD% 58.25 | Cost 3.33 | N-align 6 | LD% 55.5 |
| 'cune in play' in ostábla | | | ox | | |
| H. <i>os</i> | [o - f - -] | | H. <i>ökör</i> | [ø k ø r] | |
| WOT. <i>alçuk</i> | [a tʃ u k] | | WOT. <i>ökür</i> | [ø k y r] | |
| Cost 4.16 | N-align 5 | LD% 83.2 | Cost 0.33 | N-align 4 | LD% 8.25 |
| to stitch, to put on a dress | | | to elect, to select | | |
| H. <i>ölt</i> | [ø l t] | | H. <i>ön(ik)</i> | [ø n] | |
| WOT. <i>ilt</i> | [i l t] | | WOT. <i>ün</i> | [y: n] | |
| Cost 0.66 | N-align 3 | LD% 22 | Cost 0.66 | N-align 2 | LD% 33 |
| to grind, mill | | | Armenian | | |
| H. <i>őr</i> | [ø: - - r] | | H. <i>örmény</i> | [ø r m e: p -] | |
| WOT. <i>ävür</i> | [æ v i r] | | WOT. <i>ärmäni</i> | [æ r m æ n i] | |
| Cost 3 | N-align 4 | LD% 75 | Cost 3 | N-align 6 | LD% 50 |
| eternal | | | to rejoice, to be glad | | |
| H. <i>örök</i> | [ø r ø k] | | H. <i>örül</i> | [ø r y l] | |
| WOT. <i>ürük</i> | [y r y k] | | WOT. <i>ögür</i> | [ø y i r] | |
| Cost 0.66 | N-align 4 | LD% 16.5 | Cost 1.58 | N-align 4 | LD% 39.5 |

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| whirlpool | | | cheese | | |
| H. <i>örvény</i> | [o r v e: p] | | H. <i>sajt</i> | [f o j t] | |
| WOT. <i>ägir</i> | [æ y i r -] | | WOT. <i>çığır**</i> | [t f i y t] | |
| Cost 5.33 | N-align 5 | LD% 106.6 | Cost 1.98 | N-align 4 | LD% 49.5 |
| mud, marsh | | | yellow | | |
| H. <i>sár</i> | [f a: r] | | H. <i>sárga</i> | [f a: r g o] | |
| WOT. <i>şar</i> | [f a r] | | WOT. <i>şarug</i> | [f a r u g] | |
| Cost 0.33 | N-align 3 | LD% 11 | Cost 2 | N-align 5 | LD% 40 |
| dragon | | | sickle | | |
| H. <i>sárkány</i> | [f a: r - k a: p] | | H. <i>sarló</i> | [f o r l o: -] | |
| WOT. <i>şarakan</i> | [f a r a k a n] | | WOT. <i>çarlağ</i> | [t f a r t a y] | |
| Cost 2.33 | N-align 7 | LD% 33.29 | Cost 2.66 | N-align 6 | LD% 44.33 |
| a type of wild onion | | | footwear, sandals | | |
| H. <i>sárma</i> | [f a: r m o -] | | H. <i>saru</i> | [f o r u -] | |
| WOT. <i>şarmağ*</i> | [f a r m a y] | | WOT. <i>çaruç</i> | [t f a r u y] | |
| Cost 1.16 | N-align 6 | LD% 19.33 | Cost 1.33 | N-align 5 | LD% 26.6 |
| tent | | | fast, quick | | |
| H. <i>sátor</i> | [f a: t o r] | | H. <i>sebes</i> | [f ε b ε f] | |
| WOT. <i>çatur</i> | [t f a t u r] | | WOT. <i>şip</i> | [f i p - -] | |
| Cost 1.16 | N-align 5 | LD% 23.2 | Cost 2.83 | N-align 5 | LD% 56.6 |
| to sweep, to broom | | | söpör | | |
| H. <i>seper</i> | [f ε p ε r] | | H. <i>söpör</i> | [f o p o r] | |
| WOT. <i>şipir</i> | [f i p i r] | | WOT. <i>şipir</i> | [f i p i r] | |
| Cost 0.66 | N-align 5 | LD% 13.2 | Cost 1.32 | N-align 5 | LD% 26.4 |
| broom | | | draff, lees, dregs of wine | | |
| H. <i>seprő</i> | [f ε p - r o : -] | | H. <i>seprő</i> | [f ε p r o : -] | |
| WOT. <i>şipiriğ*</i> | [f i p i r i y] | | WOT. <i>çöprağ</i> | [t o p r a y] | |
| Cost 2.83 | N-align 7 | LD% 40.43 | Cost 3 | N-align 6 | LD% 50 |
| to injure, to hurt | | | army, troops, crowd | | |
| H. <i>sér</i> | [f ε : r] | | H. <i>sereg</i> | [f ε r ε g] | |
| WOT. <i>şir*</i> | [f i r] | | WOT. <i>çäriğ</i> | [t f æ r i g] | |
| Cost 0.66 | N-align 3 | LD% 22 | Cost 1.16 | N-align 5 | LD% 23.2 |
| a nit | | | cup, goblet | | |
| H. <i>serke</i> | [f ε r k ε] | | H. <i>serleg</i> | [f ε r l ε g] | |
| WOT. <i>şirkä</i> | [f i r k æ] | | WOT. <i>şirliğ</i> | [f i r l i g] | |
| Cost 0.66 | N-align 5 | LD% 13.2 | Cost 0.66 | N-align 6 | LD% 11 |
| bristle | | | even, flat, open (water) | | |
| H. <i>serte</i> | [f ε r t ε] | | H. <i>sik</i> | [f i: k] | |
| WOT. <i>şirt</i> | [f i r t -] | | WOT. <i>şık</i> | [f i k] | |
| Cost 1.33 | N-align 5 | LD% 26.6 | Cost 0.66 | N-align 3 | LD% 22 |
| smooth | | | running water, running channel under a mill | | |
| H. <i>sima</i> | [f i m o] | | H. <i>sió</i> | [f i o:] | |
| WOT. <i>şima</i> | [f i m a] | | WOT. <i>şiu</i> | [f i u] | |
| Cost 0.66 | N-align 4 | LD% 16.5 | Cost 0.66 | N-align 3 | LD% 22 |
| much, many | | | falcon | | |
| H. <i>sok</i> | [f o k] | | H. <i>sólyom</i> | [f o: j o m] | |
| WOT. <i>çok*</i> | [t f o k] | | WOT. <i>çavlı*</i> | [t f a v l i] | |
| Cost 0.5 | N-align 3 | LD% 16.67 | Cost 6.57 | N-align 5 | LD% 131.4 |
| dogwood (tree), cornel | | | beer | | |
| H. <i>som</i> | [f o m] | | H. <i>sör</i> | [f o r -] | |
| WOT. <i>çum</i> | [t f u m] | | WOT. <i>şire</i> | [f i r e] | |
| Cost 0.83 | N-align 3 | LD% 27.67 | Cost 1.66 | N-align 4 | LD% 41.5 |
| starlet, sturgeon | | | pike perch, zander | | |
| H. <i>sóreg</i> | [f o : - r ε g - -] | | H. <i>süllő</i> | [f y l: o : -] | |

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| WOT. <i>şivriğey</i> | [f i v r i g e j] | | WOT. <i>şilliğ</i> | [f i l i y] | |
| Cost 4.33 | N-align 8 | LD% 54.12 | Cost 1.83 | N-align 5 | LD% 36.6 |
| | scurvy | | | dense, thick (of woods or soup) | |
| H. <i>süly</i> | [f y j - -] | | H. <i>sűrű</i> | [f y : r y : -] | |
| WOT. <i>şiğül</i> | [f i y y l] | | WOT. <i>çırağ*</i> | [t ğ i r a y] | |
| Cost 3.15 | N-align 5 | LD% 63 | Cost 3 | N-align 5 | LD% 60 |
| | uncle, nephew, brother/sister in law | | | uvula, the recurved point of a fishing hook | |
| H. <i>sív</i> | [f y v] | | H. <i>szaka</i> | [s o k o -] | |
| WOT. <i>şiğ*</i> | [f i y] | | WOT. <i>sakağ</i> | [s a k a y] | |
| Cost 1 | N-align 3 | LD% 33.33 | Cost 1.16 | N-align 5 | LD% 23.2 |
| | beard | | | raft | |
| H. <i>szakáll</i> | [s o k a : l :] | | H. <i>szál</i> | [s a : l] | |
| WOT. <i>sakal</i> | [s a k a t] | | WOT. <i>sal</i> | [s a : t] | |
| Cost 1.33 | N-align 5 | LD% 26.6 | Cost 0.33 | N-align 3 | LD% 11 |
| | number | | | to have pity for, to regret | |
| H. <i>szám</i> | [s a : m] | | H. <i>szán</i> | [s a : - - n] | |
| WOT. <i>sam</i> | [s a : m] | | WOT. <i>sağın</i> | [s a y ğ i n] | |
| Cost 0 | N-align 3 | LD% 0 | Cost 1.83 | N-align 5 | LD% 36.6 |
| | to wish, to intend something for somebody | | | bucket, wooden pail | |
| H. <i>szán</i> | [s a : n] | | H. <i>szapu</i> | [s o p u -] | |
| WOT. <i>san</i> | [s a : n] | | WOT. <i>sapağ*</i> | [s a p a y] | |
| Cost 0 | N-align 3 | LD% 0 | Cost 1.5 | N-align 5 | LD% 30 |
| | light coloured, yellowish, pale | | | wing | |
| H. <i>szár</i> | [s a : r] | | H. <i>szárny</i> | [s a : - r - p] | |
| WOT. <i>sar*</i> | [s a r] | | WOT. <i>çağrın</i> | [t ğ a y ğ i n] | |
| Cost 0.33 | N-align 3 | LD% 11 | Cost 3.33 | N-align 6 | LD% 55.5 |
| | grocer, grand handler | | | chair, seat, bench, throne | |
| H. <i>szatócs</i> | [s o t o : - t ğ -] | | H. <i>szék</i> | [s e : k -] | |
| WOT. <i>satiğçi</i> | [s a t i y t ğ i] | | WOT. <i>sakü</i> | [s a k y] | |
| Cost 2.83 | N-align 7 | LD% 40.43 | Cost 1.66 | N-align 4 | LD% 41.5 |
| | wind | | | to slumber, to doze | |
| H. <i>szél</i> | [s e : l] | | H. <i>szendered(ik)</i> | [s ε n d ε r ε d] | |
| WOT. <i>sel</i> | [s e : l] | | WOT. <i>söntür*</i> | [s o n t y r - -] | |
| Cost 0 | N-align 3 | LD% 0 | Cost 3.83 | N-align 8 | LD% 47.87 |
| | beautiful | | | freckle, sun spot, stain | |
| H. <i>szép</i> | [s e : p] | | H. <i>szepő</i> | [s ε p l o -] | |
| WOT. <i>sip*</i> | [s i p] | | WOT. <i>säpliğ</i> | [s a p l i y] | |
| Cost 0.66 | N-align 3 | LD% 22 | Cost 1.5 | N-align 6 | LD% 25 |
| | part of a village, street, group of people | | | threshing floor (round) | |
| H. <i>szer</i> | [s ε r] | | H. <i>szérű</i> | [s e : r y : -] | |
| WOT. <i>Çer</i> | [t ğ e r] | | WOT. <i>çürüğ*</i> | [t ğ y r y y] | |
| Cost 1.16 | N-align 3 | LD% 38.67 | Cost 2.66 | N-align 5 | LD% 53.2 |
| | fumes, vapour, spirits, alcohol, humours | | | colour, face, external appearance | |
| H. <i>szesz</i> | [s ε s] | | H. <i>szín</i> | [s i : n] | |
| WOT. <i>Sis</i> | [s i s] | | WOT. <i>sin</i> | [s i n] | |
| Cost 0.33 | N-align 3 | LD% 11 | Cost 0.33 | N-align 3 | LD% 11 |
| | thin hide rope, strap | | | rock, cliff, occiput, crest (of mountain) | |
| H. <i>szirony</i> | [s i - r o p] | | H. <i>szirt</i> | [s i r t] | |
| WOT. <i>Styrum</i> | [s i j r u m] | | WOT. <i>sirt</i> | [s i r t] | |
| Cost 2.16 | N-align 6 | LD% 36 | Cost 0.33 | N-align 4 | LD% 8.25 |
| | word | | | to spread, to scatter, to winnow | |
| H. <i>szó</i> | [s o : -] | | H. <i>szór</i> | [s o : - - r] | |
| WOT. <i>Sav</i> | [s a v] | | WOT. <i>sawur</i> | [s a w u r] | |

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| Cost 2 | N-align 3 | LD% 66.67 | Cost 2.5 | N-align 5 | LD% 50 |
| | grasshoper | | | to leap, to jump, to escape, to flee | |
| H. <i>szöcske</i> | [s ø tʃ k ε] | | H. <i>szök(ik)</i> | [s ø k] | |
| WOT. <i>Sek</i> | [s e - k -] | | WOT. <i>sek</i> | [s e k] | |
| Cost 2.33 | N-align 5 | LD% 46.6 | Cost 0.33 | N-align 3 | LD% 11 |
| | grape, wine grape | | | mosquito, gnat | |
| H. <i>szőlő</i> | [s ø l ø -] | | H. <i>szúnyog</i> | [s u : p o g] | |
| WOT. <i>Çeleğ</i> | [tʃ e l e y] | | WOT. <i>sinuk</i> | [s i ŋ u k] | |
| Cost 2 | N-align 5 | LD% 40 | Cost 2.5 | N-align 5 | LD% 50 |
| | furrier | | | to cease, to stop | |
| H. <i>szücs</i> | [s y : - tʃ -] | | H. <i>szűn(ik)</i> | [s y : n] | |
| WOT. <i>Çiğçi</i> | [tʃ i y tʃ i] | | WOT. <i>sön</i> | [s ø n] | |
| Cost 2.66 | N-align 5 | LD% 53.2 | Cost 0.66 | N-align 3 | LD% 22 |
| | to strain, to filter | | | virgin, pure | |
| H. <i>szűr</i> | [s y : r] | | H. <i>szűz</i> | [s y : z - -] | |
| WOT. <i>Sür</i> | [s y r] | | WOT. <i>süzök*</i> | [s y z ø k] | |
| Cost 0.33 | N-align 3 | LD% 11 | Cost 2.33 | N-align 5 | LD% 46.6 |
| | sorcerer, medicine man | | | advice, council | |
| H. <i>táltos</i> | [t a : l t o s -] | | H. <i>tanács</i> | [t ø n a : - tʃ] | |
| WOT. <i>taltuçi*</i> | [t a t t u tʃ i] | | WOT. <i>tanılç</i> | [t a n i t tʃ] | |
| Cost 2.83 | N-align 7 | LD% 40.43 | Cost 2 | N-align 6 | LD% 33.33 |
| | witness | | | to feed, to nourish | |
| H. <i>tanú</i> | [t ø n u : -] | | H. <i>táplál</i> | [t a : p l a : l] | |
| WOT. <i>Tanuğ</i> | [t a n u y] | | WOT. <i>taplağ</i> | [t a p t a y] | |
| Cost 1.16 | N-align 5 | LD% 23.2 | Cost 2.25 | N-align 6 | LD% 37.5 |
| | tinder, tinder fungus | | | bald | |
| H. <i>tapló</i> | [t ø p l o : -] | | H. <i>tar</i> | [t ø r] | |
| WOT. <i>Topluğ</i> | [t ø p t u y] | | WOT. <i>tar</i> | [t a r] | |
| Cost 1.83 | N-align 6 | LD% 30.5 | Cost 0.33 | N-align 3 | LD% 11 |
| | plough field, arable field, stubble field | | | to hold, carry, to last | |
| H. <i>tarló</i> | [t ø r - l o : -] | | H. <i>tart</i> | [t ø r t] | |
| WOT. <i>Tarlağ</i> | [t a r i t a y] | | WOT. <i>tart</i> | [t a r t] | |
| Cost 3.16 | N-align 7 | LD% 45.14 | Cost 0.33 | N-align 4 | LD% 8.25 |
| | tatar | | | name of several kinds of plants | |
| H. <i>tatár</i> | [t ø t a : r] | | H. <i>tátorján</i> | [t a : t ø r j a : n] | |
| WOT. <i>tatar</i> | [t a t a r] | | WOT. <i>tatran</i> | [t a t - r - a ŋ] | |
| Cost 0.66 | N-align 5 | LD% 13.2 | Cost 2.83 | N-align 8 | LD% 35.37 |
| | to wind something round, to twist | | | through, wash tub, hutch | |
| H. <i>taker</i> | [t ε k ε r] | | H. <i>teknő</i> | [t ε k - n ø -] | |
| WOT. <i>täkir</i> | [t æ k i r] | | WOT. <i>täkänäğ</i> | [t æ k æ n æ y] | |
| Cost 0.66 | N-align 5 | LD% 13.2 | Cost 2.5 | N-align 7 | LD% 35.71 |
| | strap (on a whip, or on a kind of sandal) | | | to vegetate, to linger in misery | |
| H. <i>telek</i> | [t ε l ε k] | | H. <i>teng</i> | [t ε ŋ] | |
| WOT. <i>tilök</i> | [t i l ø k] | | WOT. <i>tän*</i> | [t æ ŋ -] | |
| Cost 1 | N-align 5 | LD% 20 | Cost 2 | N-align 4 | LD% 50 |
| | Axle | | | sea | |
| H. <i>tengely</i> | [t ε ŋ g ε j] | | H. <i>tenger</i> | [t ε ŋ ε r] | |
| WOT. <i>tenäl</i> | [t e n - æ l] | | WOT. <i>tänir</i> | [t æ ŋ i r] | |
| Cost 2.91 | N-align 6 | LD% 48.5 | Cost 0.66 | N-align 5 | LD% 13.2 |
| | to turn, to change the original direction | | | knee | |
| H. <i>tér</i> | [t e : - - r] | | H. <i>térd</i> | [t e : r d] | |
| WOT. <i>tävir</i> | [t æ v i r] | | WOT. <i>tir</i> | [t i : r -] | |
| Cost 2.66 | N-align 5 | LD% 53.2 | Cost 0.83 | N-align 4 | LD% 20.75 |
| | hall, chamber, great room | | | camel | |

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| H. <i>terem</i> | [tɛrɛm] | | | H. <i>teve</i> | [tɛvɛ] | | |
| WOT. <i>terem</i> | [tɛrɛm] | | | WOT. <i>teve</i> | [tɛvɛ] | | |
| Cost 0.66 | N-align 5 | LD% 13.2 | | Cost 0.66 | N-align 4 | LD% 16.5 | |
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| H. <i>tiló</i> | [tɪl-o:-] | | | H. <i>tinó</i> | [tɪnɔ:] | | |
| WOT. <i>talkıǵ</i> | [tɒtkıy] | | | WOT. <i>tana</i> | [tɒnɒ] | | |
| Cost 3.5 | N-align 6 | LD% 58.33 | | Cost 1.66 | N-align 4 | LD% 41.5 | |
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| H. <i>toj(ik)</i> | [toj] | | | H. <i>tok</i> | [tok-] | | |
| WOT. <i>tuǵ</i> | [tuy] | | | WOT. <i>toku</i> | [toku] | | |
| Cost 1.15 | N-align 3 | LD% 38.33 | | Cost 1 | N-align 4 | LD% 25 | |
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| H. <i>tolmács</i> | [tolmɑ:tʃ] | | | H. <i>torma</i> | [tormɒ] | | |
| WOT. <i>tolmaç</i> | [tolmɑ:tʃ] | | | WOT. <i>turma</i> | [turma] | | |
| Cost 0.66 | N-align 6 | LD% 11 | | Cost 0.66 | N-align 5 | LD% 13.2 | |
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| H. <i>torol</i> | [torol] | | | H. <i>torontál</i> | [torontɑ:l] | | |
| WOT. <i>turo*</i> | [turo-] | | | WOT. <i>turuntay</i> | [turuntaj] | | |
| Cost 1.33 | N-align 5 | LD% 26.6 | | Cost 2.25 | N-align 8 | LD% 28.12 | |
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| H. <i>tót</i> | [tot] | | | H. <i>tökél</i> | [tøkɛ:l] | | |
| WOT. <i>tat</i> | [tat] | | | WOT. <i>tükä*</i> | [tykæ-] | | |
| Cost 0.66 | N-align 3 | LD% 22 | | Cost 2 | N-align 5 | LD% 40 | |
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| H. <i>tömény</i> | [tømɛ:p] | | | H. <i>tör</i> | [tør-] | | |
| WOT. <i>tümän</i> | [tymæn] | | | WOT. <i>töǵür*</i> | [tøyyr] | | |
| Cost 1.66 | N-align 5 | LD% 33.2 | | Cost 3 | N-align 5 | LD% 60 | |
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| H. <i>tór</i> | [tør] | | | H. <i>török</i> | [tørøk] | | |
| WOT. <i>tör*</i> | [tør] | | | WOT. <i>türkü</i> | [tyrky] | | |
| Cost 0 | N-align 3 | LD% 0 | | Cost 1.66 | N-align 5 | LD% 33.2 | |
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| H. <i>történ(ik)</i> | [tørtɛ:n] | | | H. <i>törvény</i> | [tørv-ɛ:p] | | |
| WOT. <i>törtün</i> | [törtyn] | | | WOT. <i>törügän</i> | [tøryyæn] | | |
| Cost 1 | N-align 6 | LD% 16.67 | | Cost 3.15 | N-align 7 | LD% 45 | |
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| H. <i>tulok</i> | [tulok] | | | H. <i>túro</i> | [tu:ro-] | | |
| WOT. <i>tokol</i> | [tokol] | | | WOT. <i>torag</i> | [toray] | | |
| Cost 1.33 | N-align 5 | LD% 26.6 | | Cost 1.83 | N-align 5 | LD% 36.6 | |
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| H. <i>turul</i> | [tu-rul] | | | H. <i>túzok</i> | [tu:-zok] | | |
| WOT. <i>toǵrıl</i> | [toyyrıt] | | | WOT. <i>togzak</i> | [togðak] | | |
| Cost 1.5 | N-align 6 | LD% 25 | | Cost 2.48 | N-align 6 | LD% 41.33 | |
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| H. <i>tükör</i> | [tykør] | | | H. <i>tűr</i> | [ty:r] | | |
| WOT. <i>tikär</i> | [tikær] | | | WOT. <i>tör</i> | [tør] | | |
| Cost 1 | N-align 5 | LD% 20 | | Cost 0.66 | N-align 3 | LD% 22 | |
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| H. <i>tűr</i> | [ty:r] | | | H. <i>tyúk</i> | [c--u:k] | | |
| WOT. <i>tür</i> | [tyr] | | | WOT. <i>tiğuk</i> | [tiyuk] | | |
| Cost 0.33 | N-align 3 | LD% 11 | | Cost 2.5 | N-align 5 | LD% 50 | |
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| H. <i>ugu</i> | [ugu] | | | H. <i>úr</i> | [u:r-] | | |

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| WOT. <i>uğu*</i> | [u y u] | WOT. <i>urı*</i> | [u r ı] | | |
| Cost 0.41 | N-align 3 | LD% 13.67 | Cost 1.33 | N-align 3 | LD% 44.33 |
| to refresh oneself, to rest, to become cured | | | feast | | |
| H. <i>üdül</i> | [y d y l] | H. <i>ünnep</i> | [y n ε p] | | |
| WOT. <i>edü*</i> | [e d y -] | WOT. <i>edü</i> | [e d y -] | | |
| Cost 1.66 | N-align 4 | LD% 41.5 | Cost 2.9 | N-align 4 | LD% 72.5 |
| heifer, roe doe | | | ground squirrel | | |
| H. <i>ünő</i> | [y n ø: -] | H. <i>ürge</i> | [y r g ε] | | |
| WOT. <i>inäğ</i> | [i n æ y] | WOT. <i>örgä</i> | [ø r g æ] | | |
| Cost 1.83 | N-align 4 | LD% 45.75 | Cost 0.66 | N-align 4 | LD% 16.5 |
| wormwood | | | wether, sheep | | |
| H. <i>üröm</i> | [y r ø m] | H. <i>ürü</i> | [y r y -] | | |
| WOT. <i>erim</i> | [e r i m] | WOT. <i>iriğ</i> | [i r i y] | | |
| Cost 1.33 | N-align 4 | LD% 33.25 | Cost 1.16 | N-align 4 | LD% 29 |
| hot embers, extinguished embers | | | one-year-old female sheep | | |
| H. <i>üszök</i> | [y s ø k] | H. <i>üvecs</i> | [y v ε tʃ] | | |
| WOT. <i>isig</i> | [i s i g] | WOT. <i>öväç</i> | [ø v æ tʃ] | | |
| Cost 1.66 | N-align 4 | LD% 41.5 | Cost 0.66 | N-align 4 | LD% 16.5 |
| to hollow out, to scoop out | | | trough, tray | | |
| H. <i>váj</i> | [v a: j] | H. <i>vályú</i> | [v a: j u: -] | | |
| WOT. <i>vay</i> | [v a j] | WOT. <i>valağ</i> | [v a l a y] | | |
| Cost 0.33 | N-align 3 | LD% 11 | Cost 3.08 | N-align 5 | LD% 61.6 |
| fishweir | | | a hole in the ice | | |
| H. <i>vejsze</i> | [v ε j s ε -] | H. <i>vék</i> | [v e: k -] | | |
| WOT. <i>väşäg*</i> | [v æ j f æ y] | WOT. <i>väkü</i> | [v æ k y] | | |
| Cost 1.5 | N-align 6 | LD% 25 | Cost 1.66 | N-align 4 | LD% 41.5 |
| guest | | | to plait, to lay the rope | | |
| H. <i>vendég</i> | [v ε n d e: g] | H. <i>ver</i> | [v ε r] | | |
| WOT. <i>vändäg*</i> | [v æ n d æ g] | WOT. <i>ver*</i> | [v e r] | | |
| Cost 1 | N-align 6 | LD% 16.67 | Cost 0.33 | N-align 3 | LD% 11 |
| gable, frontispiece | | | chamois | | |
| H. <i>vértelék</i> | [v e: r t ε l ε k] | H. <i>zerge</i> | [z ε r g ε] | | |
| WOT. <i>vertülük</i> | [v e r t y l y k] | WOT. <i>särgä*</i> | [f æ r g æ] | | |
| Cost 1.66 | N-align 8 | LD% 20.75 | Cost 1.5 | N-align 5 | LD% 30 |
| yellow | | | a piece of land, parcel, patch | | |
| H. <i>sár</i> | [f a: r -] | H. <i>telek</i> | [t ε l ε k] | | |
| WOT. <i>sarı</i> | [s a r ı] | WOT. <i>tilök</i> | [t i l ø k] | | |
| Cost 1.66 | N-align 4 | LD% 41.5 | Cost 1 | N-align 5 | LD% 20 |
| depot | | | | | |
| H. <i>tár</i> | [t a: - - r] | | | | |
| WOT. <i>tavar</i> | [t a v a r] | | | | |
| Cost 2.33 | N-align 5 | LD% 46.6 | | | |

Results & Patterns

This part is a practice of frequency and demonstrates some key findings. The most frequent phonological tendencies in terms of adaptations mirror the phonological disposition of Hungarian towards the nativization process of loanwords. Only the most striking adaptation patterns are displayed in this section. The results demonstrate certain phonological processings that the Hungarian language operates when nativizing loanwords. The significant point here is that the adaptations display systematic figures (patterns) through which we understand that phonological constraints behave in a determined unarbitrary fashion when integrating borrowings. This, of course, can be evaluated as an indication that the nativization through production stance has a valid

fundamental. The patterns that are displayed below demonstrate that the adaptations are not the results of the random perception of mere phonetic inputs.

Table 11: Adaptation patterns

| Pattern | Rate in the whole data | Rate in the relevant data | Common adapted forms |
|--|------------------------|---------------------------|--|
| Heavy syllables | 52.25% (377/197) | 52.25% (377/197) | long vowel, consonant clustering |
| Nasal palatalization | 7.43% (377/28) | 35.44% (79/28) | [ɲ] |
| Nasal alveolarization | 1.59% (377/6) | 66.66% (9/6) | [ɲ] |
| Adaptation of [u] | 13.53% (377/51) | 100% (51/51) | [o], [ɒ], [ɪ] |
| Adaptation of [ɣ] | 28.65% (377/108) | 100% (108/108) | [j] |
| Labialization of vowels | 45.36% (377/171) | - | [a]⇒[ɒ][o], [e]⇒[ø][y], [i]⇒[ø][y], [i]⇒[o][ɒ] |
| Loss of secondary velar articulation [t] | 8.49% (377/32) | 76.19% (42/32) | [l] |
| Adaptation of [j] to [ɟ] | 8.75% (377/33) | 64.71% (51/33) | [ɟ] |
| Adaptation of [æ] | 28.38% (377/107) | 100% (107/107) | [e], [ɛ], [ø] |
| Adaptation of [tʃ] to [ʃ] | 6.37% (377/24) | 29.63% (81/24) | [ʃ] |

Heavy syllables

“In a number of foreign words, Hungarian has to meet a peculiar requirement, they have to contain a heavy syllable” (Kertész, 2006 p. 12). Heavy syllables appear either as syllables that contain long vowels or as syllables that display the gemination of consonants, or consonant clusters. Although long vowels are very scarce in Turkic phonotactics (they are almost entirely from loanwords), they are very typical in Hungarian. It is seen in this study that 197 of the Hungarian words with WOT origin (or another origin but derived from WOT) out of 377, exhibit this adaptation. Adaptations occur both in initial and non-initial or terminative syllables. Gemination is observed in 2 adaptations, /bökk/ [byk:] and /szakáll/ [sɒka:l:]. Degemination on the other hand can be seen in 2 words, /ács/ [a:tʃ] and /csákány/ [tʃa:ka:ɲ]. Heavy syllables that display consonant clustering are /bilincs/, /bors/, /borz/, /böjt/, /bölc/, /bökk/, /erkölcs/, /gyárt/, /gyöngy/, /gyümölcs/, /ijeszt/, /könyv/, /körtvély/, /orv/, /ölt/, /sajt/, /szakáll/, /szárny/, /szirt/, /tart/, /teng/, /térdf/. Among these, /bors/, /erkölcs/, /gyümölcs/, /körtvély/, /ölt/, /sajt/, /szirt/, /tart/ already display clustering in their source counterparts.

Nasal palatalization and alveolarization

28 adaptations exhibit nasal palatalization. This sound change is almost always observed in final syllables although contrarian examples such as /kanyaró/ [kɒɲɒro:] do exist. Nasal palatalization is known to occur in Hungarian phonology before palatal consonants (Siptár, 1994, pp. 5-32) and full palatal assimilation is an obligatory feature. When the case is loanword adaptations, there seems to be no regular aspect to it, except that it mainly occurs if the nasal sound is the final phoneme in the lexeme. On the other hand, alveolarization of the velar nasal [ŋ] is observed in 6 pairs; /enged/ [ɛngɛd], /gyenge/ [ɟɛngɛ], /ing/ [ing], /katáng/ [kɒta:ng], /tátorján/ [ta:torja:n], /teng/ [tɛng].

High back unrounded vowel

[u] or [i] as in scholarly writing of Turkic languages (Erdal, 2004, p. 52) is missing from the Hungarian native sound system. 51 adaptations are discovered among the pairs and 35 of them are substitutions. Nativization of this sound in the data commonly appears either as [o], [ɒ] or [ɪ] with the following exceptions; /béklyó/ [be:kjo:] < /bikağu/ [bikayu], /csiger/ [tʃigɛr] < /çıgır/ [tʃigır], /dug/ [problematic etymology discussed in Honti (2017, pp. 13-15)] [dug] < /dig/ [dīg], /herjó/ [herjo:] < /hırğuy/ [χırɟuj], /sűrű/ [ʃy:ry:] < /çırağ/ [tʃıray], /tanács/ [tɒna:tʃ] < /tanılç/ [taniłtʃ], /turul/ [turul] < /toğrı/ [toɟrıt]. Since [i] is a [+high] and [+back] vowel, it is perceptible that the three predominant substitutions share at least one of these features. The salient outlook in the adaptation of this sound in Hungarian would be that it goes out of the classical front-back contrast of the harmonical boundaries

(of Turkic and Hungarian both) as it assimilates into [i] very often. While there is no example that spoils the front-back harmony in the entirety of the WOT words with [i] in them, in the Hungarian adaptations the nativization process evidently does not follow the harmonical rules.

Voiced velar fricative

There is no doubt that the [ɣ] was not silent in the old Turkic as mentioned before in this study. Borrowings (such as yogurt) that preserved this sound as a non-silent variant in foreign languages affirm this. This being the case, it can be argued that the transitional feature of this sound was still present, nevertheless. A shred of strong evidence is that out of 108 occurrences, in only two of the WOT words it is not preceded by a vowel; /hırğuy/ [χ̣irɣuj] > /herjó/ [hɛrjo:], /korğan/ [koryan] > /korhány/ [korha:n]. Another indication is that out of those 108 occurrences, 98 of them turn out to be a deletion or a substitution to the semivowel [j] in the Hungarian adaptations. The ten exceptions are the following; /bölc/ [bøltʃ] < /büğüci/ [byɣytʃ:i], /büvös/ [by:vøs] < /büğü/ [byɣy], /korhány/ [korha:n] < /korğan/ [koryan], /könyv/ [kønv] < /künüg/ [kynyɣ], /köpcös/ [køptsøʃ] < /köpçağ/ [køptʃæy], /örül/ [øryl] < /öğir/ [øɣir], /örvény/ [ørve:n] < /äğir/ [æɣir], /süv/ [ʃyv] < /şiğ/ [ʃiɣ], /taplál/ [ta:pla:l] < /taplağ/ [taplay], /tör/ [tør] < /tör/ [tør], /ugu/ [ugu] < /uğu/ [uɣu]. As a result, [ɣ] emerges as another pattern in which the adaptations display a similar characteristic to the “soft g” in modern Turkish. It mainly functions as a vowel lengthener in the adaptations.

Labialization of vowels

Substitution into the low back rounded vowel [ɒ] is a common adaptation. It takes place of the [a] sound in 64 words and thus appears as a common pattern. [a] to [o] pattern is observed in 30 comparisons while [e] to [ø] and [e] to [y] occurs in 15 adaptations. [i] to [ø] and [i] to [y] pattern display 35 occasions with also 1 [i] to [u] exception. [i] to [o] and [i] to [ɒ] patterns occur 14 times, also 2 [i] to [u] and 1 [i] to [y] adaptations are observed. Apart from these changes, 4 occurrences of [a] to [u], 2 occurrences of [a] to [y], and 3 occurrences of [a] to [ø] are recorded. As a result, labialization of vowels takes place in 171 pairs.

Loss of secondary velar articulation /ʎ/

This adaptation occurs in 32 words. In Turkic phonology, [ʎ] coexists with back vowels while [l] with front vowels.

Adaptation of /j/ to /y/

This adaptation takes place only in the initial position of the words. 33 occurrences are observed.

+low quality of the front unrounded vowels /a/ and /æ/

Although the official IPA symbol of the low central unrounded vowel is [ä], instead of this, [a] is used by the authors in the lexicon. This trend is a common one in the literature. [ä] on the other hand, -being absent in Hungarian- is used in the lexicon for the front variant of this sound in Turkic words. However, the quality of this sound in Turkic words is mutant. In most cases in Turkic languages, the quality is near-open, therefore [æ]. Considering the fact that in the comparisons, it is always assimilated into either [e], [ɛ], and [ø] but never [a], advocates this condition. 95 occasions displaying substitutions from [æ] are observed in the adaptations out of 107 occurrences. 12 times the adaptation occurs as deletions.

Adaptation of /tʃ/ to /ʃ/

This adaptation occurs in 24 pairs (6.37%) while the opposite is recorded in 2; *gyümölcs* [ɣymøltʃ], *gyümölcsény* [ɣymøltʃe:n].

Discussion

Although the principles are default, refinement approaches to the operation cost in the Levenshtein algorithms, make significant differences in terms of acquired results. Reflection rates of some adaptations in human perception may be little to none. Some adaptations, on the other hand, may sound obvious but still less distant than others. Perhaps, to begin with, a computerized (or non-computerized) advancement of a measurement methodology that evaluates the perceived distance of a certain set of sounds particular to two phonological systems may be a good approach. A database that is big enough to consist of a sufficient number of co-occurrences of the same sound pairs is needed to achieve this. In any case, it is necessary to have big data with a large word base to apply the LD and obtain meaningful, consistent findings. Narrow data such as 35 acknowledged Cuman loanwords in Hungarian, is a limitation and appears as a disadvantage of the application of the LD. This research is conducted with significantly large data on WOT loanwords in Hungarian. Another disadvantage is that the refinement strategies require a good command of the phonological knowledge of the compared languages. If any of the languages lack comprehensive phonological data as in Cuman, being an extinct language, this can also emerge as a disadvantage. Advantages on the other hand are being able to quantitate the relatedness of compared lexemes and acquiring data concerning the commonness of certain adaptations as regular patterns. It should be noted, as Honti also states, the changes in consonants are known to show a greater degree of regularity than those of vowels (Honti, 2017, p. 189)

The main aims of Turkic-Hungarian linguistic studies have always been etymological. Regularities, patterns, and a typology ascertainment of loanword phonology in the concept of ‘loanword adaptation’ are still puzzlements to work on. This study intends to contribute to the settlement of this issue. The intensive Hungarian-Turkic cohabitation coincides with the period between the 6th and the 10th centuries when the *late ancient Hungarian* was spoken (Róna-Tas & Berta, 2011, p. 1072). This time period concurs with the post-Hunnic era in the Eurasian steppes. In the history of the Hungarian language, this period represents the late Proto-Hungarian and early Old Hungarian periods (Kiss, 2017). “During this period, the Hungarian language existed as the spoken language of tribal dialects of the changing settlement areas” (Kiss, 2018b, p. 45). As the WOT material in Hungarian is one of the most valuable sources in terms of the linguistic properties of WOT speakers, adaptational features of these words can be useful for reconstruction studies and for a better comprehension of the linguistic properties of those languages that existed in that era -including the Hunnic- and extinct with little trace. Today the classification of some of these languages is still problematic and the acknowledgments of their phonology are limited.

“Often two languages or families showing striking lexical similarities that unambiguously prove a historical relationship, but whether these lexical similarities are due to common inheritance or to borrowing is a matter of dispute. In such disputes, more systematic knowledge of the general patterns of loanword distribution will hopefully be helpful in the future” (Haspelmath, 2009, p. 36).

The automatic phonetic comparisons may also contribute to the settlement of the discussion of the phonological vs perceptual nature of adaptations. There are different aspects concerning the background of these changes. Some of them consider the adaptations as minor phonetic transformations that are the results of perceptual processes (Pepercamp, 2005, p. 341) and some of them identify them as phonological equivalences: “Our results support the view of the loanword input to the phonology the borrowing language is immediately interpreted as a phonological representation by it and handled by its constraint set” (Paradis & Lacharite, 1997, p. 380). There are also some interactive theories such as Boersma & Hamann (2009) and Kenstowicz & Suchato (2006) claiming that both views apply fractionally. The phonological versus phonetic nature of loanwords has been in debate for many years now and it is a curious case whether the acoustic changes of languages are

regular to a large extent in terms of following similar patterns or not. Nevertheless, as more languages are examined, fewer regularities seemingly become existent (Kertész, 2006, p. 12).

(Danesi, 1985) works on 233 loanwords in Canadian English. These are Italo-Canadian vocabulary, originating from Italian native speakers who migrated to Canada. He puts a strong emphasis on the importance of data-oriented approaches when it comes to dealing with nativization questions, instead of theory-based ones. The essence of his study is that the author detects several phonological processes in nativization, such as *vowel suffixation* of words with consonantal endings or gender assignment to nouns. There are similar studies defending the phonological stance such as (Jacobs & Gussenhoven, 2000), (LaCharité & Paradis, 2005), claiming that there is a highly systemic process in nativization that works on the phonological ground. This research is parallel to those studies as it proves that there are certain phonological patterns in the nativization of Turkic material in Hungarian as discussed in the above sections.

(Hyman, 1970) attracts attention to the fact that the realization of L1 sounds in L2 is different than in L3. He proposes the notion of *sprachgefühl*, an intuitive feeling for the nature of a language, or in his case, substituting correct sounds for adaptations intuitively. For this reason, phonologically sensitized automatization methods for calculating the adaptation rates of loanwords between languages may help to attest to a correct acknowledgment of the dynamics of loanword adaptation.

Another assessment for further research can be to test native speakers of the borrowing language, asking them about their perception of the source words, or vice versa with the source language speakers, and comparing the results with the automated rates. It may also be worthwhile to carry out the study described earlier in this research, considering the findings of Honti (2017) for the selection of lexemes to be analyzed.

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