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Dialect Classification and Everyday Culture: A Case Study from Austria

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Abstract: Considering dialect areas as cultural areas has a long tradition in dialectology. Especially in the first half of the 20th century, researchers explored correspondences between dialect variation and other elements of everyday culture such as traditional clothing and customs. Since then, however, few studies have compared dialect variation with everyday culture, and virtually none have used quantitative methods. This study addresses this issue by employing a multivariate, dialectometric approach. It examines dialect variation in phonology and its relationship to non-linguistic aspects of everyday culture in Austria using two types of data: (a) dialect data from a recent dialect survey, and (b) ethnographic data published in the 'Austrian Ethnographic Atlas'. Analyzing 90 phonetic-phonological and 36 ethnographic variables, statistical methods such as multidimensional scaling (MDS) and cluster analysis (CA) are employed. The results show only limited overlap between the linguistic and ethnographic data, with cultural patterns appearing more fragmented and small-scale. Geographical proximity is more indicative of cultural than linguistic similarity. MDS and CA reveal clear geographical patterns for the linguistic data that align with traditional dialect classifications. In contrast, the cultural data show less distinct clustering and only small-scale regions that do not coincide with the linguistic ones. This article discusses potential reasons for these differences.

Keywords: dialects in Austria; dialectometry; dialect classification; ethnography; folk culture

Academic Editors: Alfred Lameli, Simonetta Montemagni and John Nerbonne

Received: 25 June 2024
Revised: 3 December 2024
Accepted: 6 January 2025
Published: 23 January 2025

Citation: Vergeiner, P. C. (2025). Dialect Classification and Everyday Culture: A Case Study from Austria. *Languages*, *10*(2), 17. https://doi.org/10.3390/languages10020017

1. Introduction

The emergence of quantitative geo-linguistic methods in recent decades has allowed dialectologists to uncover geographical patterns of dialect variation based on large datasets. The discovery that mere geographical proximity is insufficient to fully explain the observed patterns has spurred investigations into additional influential factors. This has led to a renewed interest in exploring the relationship between dialect variation and other social, historical, and cultural phenomena (see also Lameli, 2014, 2019). For example, Pickl's (2013) dialectometric work on Bavarian-Swabia demonstrated that geographical patterns often coincide with ancient territorial borders; Derungs et al. (2020) found that cantonal borders exert a stronger influence on dialect similarity in Swiss German dialects than economic or religious ones; Wieling and Montemagni (2017) showed the significance of political, religious, and physical boundaries in shaping the dialect landscape of Tuscany; and Falck et al. (2012) revealed correlations between dialect similarity and cross-regional migration flows in Germany, with dialect similarity taken as a measure for cultural identity. Interestingly, however, there have been scarcely any quantitative studies comparing dialect variation with other facets of everyday culture such as traditional clothing, food customs, or local construction methods. This is the case even though dialects are considered an

important aspect of regional culture, and one would assume that the geographical patterns in dialect variation correlate with those of other cultural traits: "if two regions share many cultural habits, this indicates that those regions had numerous interactions in the course of history. This, however, would also have left lasting imprints on language structures, i.e., similarities within those other cultural domains should be reflected in language differences" (Falck et al., 2012, p. 233).

The aim of this paper is to revisit this claim. Employing a multivariate, dialectometric approach, it investigates the geographical patterns of phonological variation in Austrian dialects and their correlation with traditional everyday culture. Specifically, it addresses three key questions: (1) To what extent do patterns of geographical clustering manifest in dialect variation in Austria across 90 phonetic-phonological variables? (2) What geographical patterns exist for other (non-linguistic) aspects of traditional everyday culture? (3) How do the geographical patterns in dialect phonology relate to those of everyday culture?

To answer these questions, this study analyzes and compares two types of data: (a) dialect data from a recent direct dialect survey conducted as part of the special research project 'German in Austria', and (b) ethnographic data published in the 'Austrian Ethnographic Atlas' (*Österreichischer Volkskundeatlas*; Burgstaller et al., 1959–1979). The dialect data comprises recordings from 293 speakers across 105 locations in Austria. Analyzing a sample of 90 phonological variables, aggregative dialectometric methods such as cluster analysis and multidimensional scaling are employed to identify patterns of geographical clustering. For the ethnographic data, the regional distribution of 36 non-linguistic phenomena of everyday culture is analyzed using the same methods. Comparing the aggregated linguistic and extra-linguistic data and examining the underlying geographical patterns sheds light on the correspondence between phonological dialect areas and non-linguistic phenomena of everyday culture, contributing to our understanding of the dynamic interplay between language, culture, and geography.

2. Theoretical Background

In this section, previous research on the connections between everyday culture and dialect variation in the German-speaking area will be briefly revisited (Section 2.1). Following that, basic information on the dialect landscape of Austria according to traditional dialectology will be provided (Section 2.2).

2.1. Dialect Variation, Cultural Space, and Folk Culture

The investigation into the interplay between dialect variation, regional history, and everyday culture has been a longstanding topic of dialectological research. Since the foundation of dialectology, researchers sought to explain geographical patterns of dialect variation through cultural-historical processes. Such explanations—often summarized under the term 'extra-linguistic method' (Niebaum & Macha, 2014, pp. 105–115)—interpret geographical patterns of dialect variation through the lens of historical, political, economic, religious, and environmental factors.

This line of thinking peaked during the 1920s–1940s,[1] where the seminal work of Aubin et al. (1926) gave rise to the influential 'cultural morphology approach' (*kulturmorphologische Schule*). Its basic assumption was that cultural-historical factors form distinct 'cultural areas' (*Kulturräume*) that coincide with dialect areas (Goossens, 1987, p. 516; Grober-Glück, 1982; for a critical evaluation, see Knobloch, 2010). It was concluded "that linguistic borders are cultural borders, linguistic areas are cultural areas"[2] (Frings, 1957, p. 14). Consequently, cultural morphology viewed dialectology as part of a broader 'cultural area research' (*Kulturraumforschung*). This resulted in significant research efforts to identify correspondences between geographical patterns in dialect variation and other elements

of everyday culture (e.g., traditional clothing, religious customs, and local construction methods) in order to delineate such cultural areas (e.g., Maurer, 1931; Bach, 1937; for an overview, see Cox & Zender, 1998). Notably, in this interdisciplinary framework, there was not only close collaboration between dialectology, ethnography, and other humanities (often with significant personnel overlap between the fields) but dialectology also served as a leading science, in particular, in methodological terms. For instance, major ethnographic atlas works like the 'Atlas of German Folklore' (ADV = *Atlas der deutschen Volkskunde*, initiated in 1928) and its successor projects such as the 'Austrian Ethnographic Atlas' (ÖVA = *Österreichischer Volkskundeatlas*, initiated in 1955) drew heavily on the concepts and methods developed in dialectology (see Schmoll, 2009 for the ADV).

Following the Second World War, however, this research experienced a gradual decline, with several factors contributing to it: When the first ethnographic maps of the ADV were published, the challenges in discerning distinct patterns of geographical clustering for various elements of everyday culture became visible (Cox & Zender, 1998, p. 169). Also, researchers became more and more disillusioned as they found only limited overlap between the distributions of individual dialect features and other aspects of everyday culture (Grober-Glück, 1982, pp. 97–98; Lameli, 2019, p. 571). During the 1960s and 1970s, ethnography underwent a notable shift away from investigating geographical patterns of everyday culture (Wietschorke, 2018, pp. 47–48; but see Wiegelmann & Simon, 2007). This was partly motivated by critiques of earlier conceptions of folk culture, which were seen as overly generalizing, romanticizing, and essentialistic, and sometimes even interconnected with an ethno-nationalist agenda (for a discussion, cf., e.g., Simon, 2005 for the ADV). Similar criticisms were directed at the aforementioned dialectological approaches, which are "characterized by key terms such as *Volk*, *Kultur* and *Verkehr*", positioning them as "an integral part of the aggressively expansionist ethno-science (*Volksforschung*)" (Knobloch, 2010, p. 108).

Nevertheless, it is also important to acknowledge that these early approaches "certainly identified an important core" (Lameli, 2019, p. 571). They provided an early "sociolinguistic perspective on language change, language contact and language expansion in space" (Knobloch, 2010, p. 108). Any adequate explanation of geo-linguistic patterns must consider space not only as a physical category but also as a sociocultural and socio-psychological phenomenon (Britain, 2010, pp. 70–73). Even though many of the specific hypotheses of 'cultural area research' proved insufficient, its overall premise seems still valid; this is to say "that language is integrated in a broad spectrum of societal phenomena, which together form a regionally and historically situated social action space and only change in close interdependence with each other" (Mattheier, 1986, p. 104)[3].

A 'social action space' can be conceptualized as a 'cultural space', as described by Lameli (2014, pp. 235–236). As such, it is founded on "abstractions of actual or possibly only suspected spatially bound traditions and transmitted experiences" (Lameli, 2014, p. 236).[4] These abstractions can foster a 'spatially bound cultural identity', representing "a construct shaped by mutually stabilizing, similarly oriented spatial abstractions, which, despite lacking uniform consistency, nevertheless serve as frameworks guiding real actions" (Lameli, 2014, p. 236).[5] It can be anticipated that language behavior and other aspects of daily life are likewise affected by such cultural spaces and identities, resulting in similar geographical patterns.

2.2. Dialect Landscape of Austria

For the dialect classification of Austria, most studies refer to Wiesinger (1983), although a very similar classification can be found in earlier works such as Kranzmayer (1956).[6] In the traditional classification, the Austrian dialects are split up into two main parts (see

also Figure 1):[7] a small Alemannic region in the west and a large Bavarian area covering the rest of the country, with a Bavarian-Alemannic transition zone in-between. Within Bavarian, there is a further subdivision into South Bavarian and Central Bavarian, which are separated by a broad South-Central Bavarian transition zone. These areas can be further divided into even smaller regions, such as East Central Bavarian and West Central Bavarian (Wiesinger, 1990).

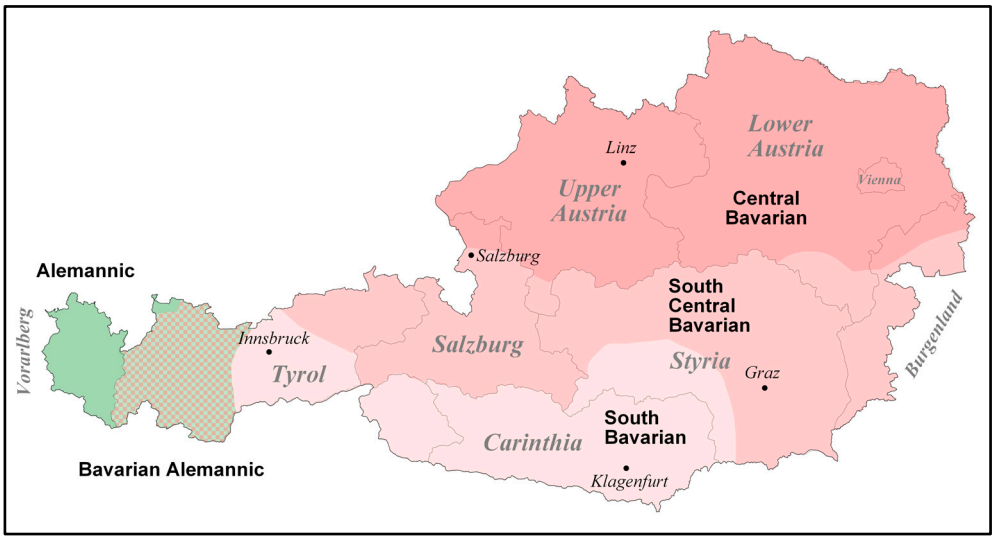

Figure 1. Traditional dialect classification of Austria (based on Wiesinger, 1983).

In traditional dialectology, these geographical patterns are often attributed to environmental factors—in particular, for the subclassification of Bavarian. The two most important factors considered in this regard are rivers, especially the Danube River, facilitating contact, and the Alpine mountains, which hinder it. Central Bavarian is viewed as an area of innovation, centered around the easily accessible Alpine foreland along the Danube; in contrast, South Bavarian is considered a relic area, isolated from Danube-driven innovations due to its remote Alpine location (Kranzmayer, 1956, pp. 5–6, Reiffenstein, 1955, p. 44; see also Figure 2 for an illustration of Austria's major landscapes and rivers).

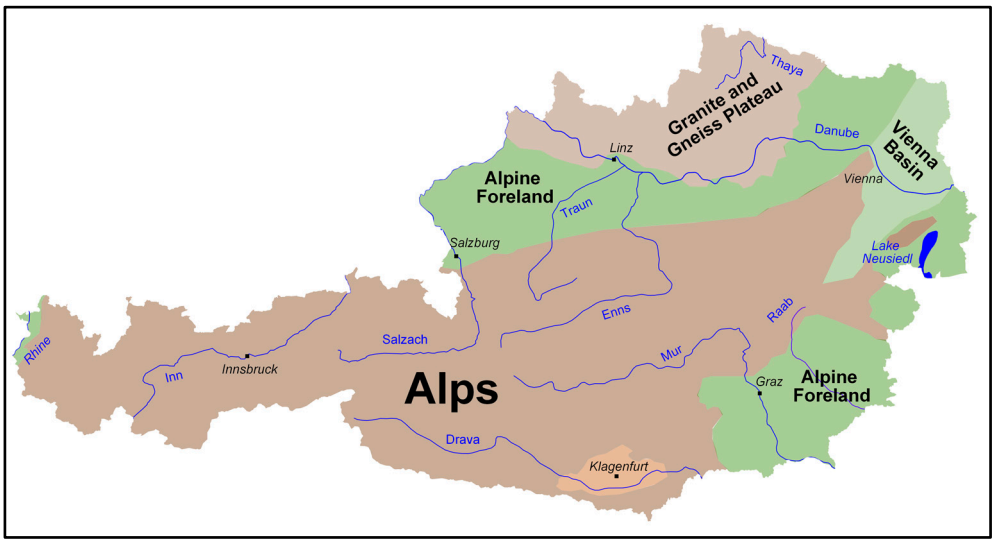

Figure 2. Austria's major landscapes and rivers (based on Scheidl & Lechleitner, 1987).

In addition to environmental factors, historical factors are considered important. Although the basic difference between Bavarian and Alemannic traces back to the Germanic settlement of today's Austria during the Early Middle Ages, the clear-cut distinctions between both dialect groups, as well as the internal divisions within Bavarian, date back to the High and Late Middle Ages (Reiffenstein, 2003, p. 2918). During this period, trade routes and urban centers (Kranzmayer, 1956, p. 6), as well as political territories and borders, had a major impact on regional dialect differentiation in Austria (Reiffenstein, 2003, p. 2889). This resulted, for example, in characteristic 'regional features' (*Landesmerkmale*) that evolved within the borders of Late Medieval territories (Kranzmayer, 1965). Consequently, the individual dialect landscapes of Central Bavarian, South-Central Bavarian, and South Bavarian are considered to be constrained within the boundaries of these territories (Wiesinger, 1990). In that regard, it is worth noting that already during the Middle Ages and the beginning of the Early Modern Period, the territories of most of today's federal states of Austria emerged and became part of the *Erblande* ('Hereditary Lands') of the House of Habsburg.[8] However, the boundaries of these territories are not exactly the same as those of the modern federal states. To illustrate this, Figure 3 shows the results of the medieval territorialization at the beginning of the Early Modern Period.[9]

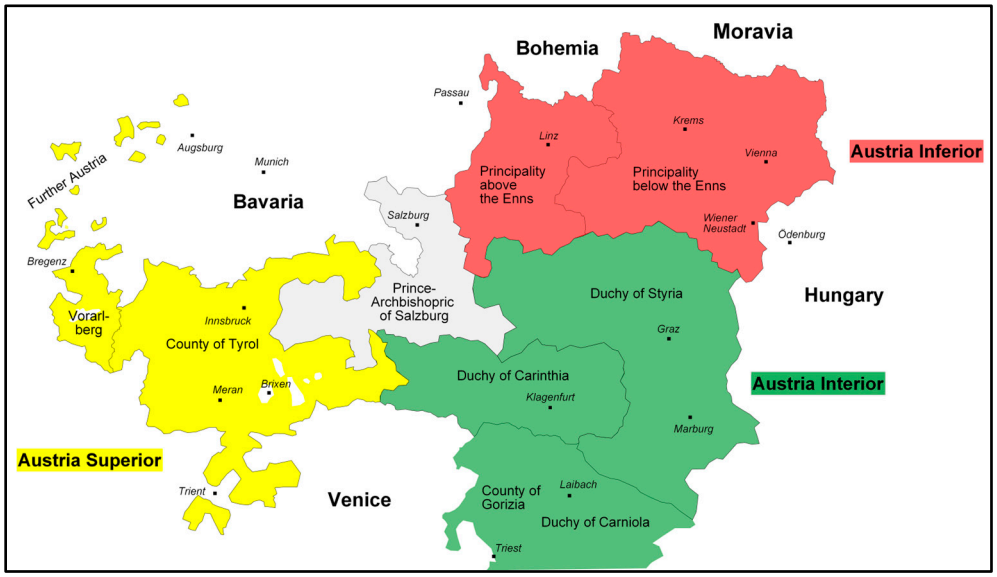

Figure 3. Austrian *Erblande* in Early Modern Times (based on Winkelbauer, 2003).

The same environmental and historical factors might be relevant for other aspects of folk culture. This is expected to yield similar geographical patterns. The following sections will test this assumption.

3. Data and Materials

In this section, the data and materials for the quantitative analysis will be presented—first, the linguistic data (Section 3.1) and then the ethnographic data (Section 3.2). Finally, the information on the statistical analyses will be provided (Section 3.3).

3.1. Linguistic Data

The linguistic data are based on the corpus of the project 'Variation and Change of Dialect Varieties in Austria (in Real and Apparent Time)', which is funded by the Austrian Science Fund (F 6002-G23) as part of the Special Research Program 'German in Austria' (F 60). The dataset consists of interviews that were recorded in 105 small, rural villages. Figure 4 depicts the locations of these research sites.[10]

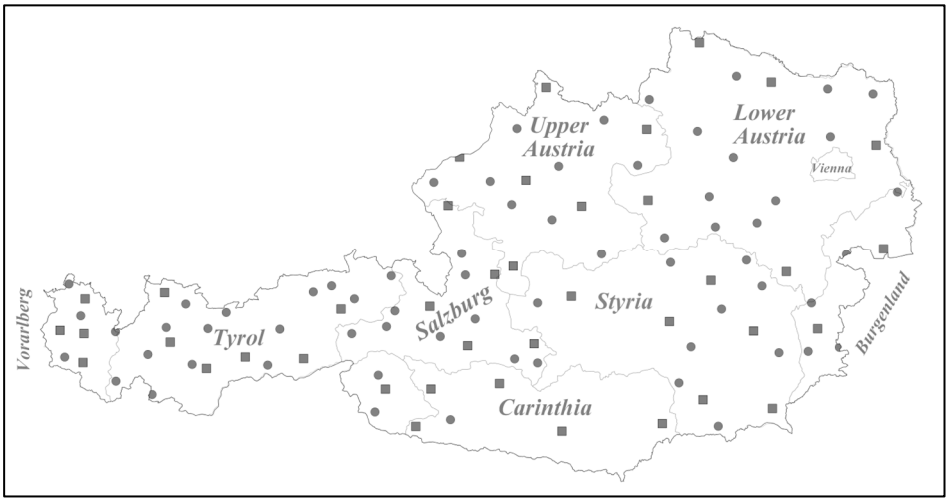

Figure 4. Research locations (squares = recorded in phase I; dots = recorded in phase II).

This study involves a total of 293 speakers, with a minimum of two speakers recorded from each location. During the initial phase of the survey (2016–2019), 163 speakers from 40 locations were surveyed, with at least four speakers per location. Subsequently, in the following phase (2020–2023), an additional 130 speakers from 65 locations were included, with two speakers per location. In both project phases, speakers from two generations were recruited at each location. Apart from this, the selection process adhered to traditional dialectological sampling criteria (Chambers & Trudgill, 1998, pp. 29–30).

The interviews were conducted by trained fieldworkers using a traditional dialect questionnaire to capture dialect features at all linguistic levels. From these data, a total of 90 variables were selected and annotated for this study, all of which pertain to phonology. This restriction was made for several reasons: First, only parts of the linguistic data have been processed for other studies, so research economic reasons made it necessary to limit the dataset. Additionally, traditional dialect classifications, such as Wiesinger (1983), are primarily based on dialect phonology, and focusing on phonology ensures comparability with these classifications. Furthermore, aside from lexical variation, phonological variation is the most thoroughly researched linguistic level for Austrian dialects. It is also more clearly separable from everyday culture, unlike particular lexical variation (see Sections 3.2 and 5).

The selection of the 90 phonological variables was based on previous research (e.g., Kranzmayer, 1956; Reiffenstein, 1955; Wiesinger, 1983, 1990) and aimed to capture the main phonological differences between the Austrian dialects. The variables relate to different phonological levels, i.e., they include vocalic phenomena in stressed and unstressed positions as well as consonantal phenomena. Table 1 shows the variable set, with the variables defined via the Middle High German (MHG) proto-system, as commonly used in German dialectology.[11]

Whenever possible, multiple lexemes were annotated for each variable to capture variation at the individual level (e.g., for MHG *â*, the lexemes *Schaf* ‘sheep’ [< MHG *schâf*], *schlafen* ‘sleep’ [< MHG *slâfen*], and *Rat* ‘advice’ [< MHG *rât*] were annotated). However, in some cases, due to limitations in the available data, only one lexeme per variable could be selected (e.g., for MHG *öü*, only *freuen* ‘be pleased’ [< MHG *vröuwen*] was annotated). The total number of annotated tokens is 45,865, with a mean value of 510 and a median value of 572 token per variable (SD = 174). Since the corpus comprises a minimum of two speakers per location and often multiple word forms per variable, relative frequency distributions were calculated for all variants at each location. These relative frequencies were then utilized for calculating a distance matrix as described in Section 3.3.

Table 1. Variable set, linguistic data.

Vowels in stressed positions	(1) MHG *â*, (2) lengthened MHG *a*, (3) non-lengthened MHG *a*, (4) MHG *æ*, (5) MHG *ä*, (6) MHG *ö*, (7) MHG *ü*, (8) MHG *ë*, (9) MHG *ô*, (10) MHG *ê*, (11) MHG *œ*, (12) MHG *î*, (13) MHG *û*, (14) MHG *iu*, (15) MHG *iu~ui*, (16) MHG *uo*, (17) MHG *üe*, (18) MHG *ie~iu~ui*, (19) MHG *ei*, (20) MHG *ei*^{2}*~a*, (21) MHG *öü*
Vowels in stressed positions in specific consonantal positions	(22) MHG *â* before *w*, (23) MHG *a~e* before *sch*, (24) MHG *i* before *d*, *t*, (25) MHG *i* before *h*, (26) MHG *o* before *ff*, (27) MHG *o* before *n*, (28) MHG *û* before *m*, (29) MHG *ô* before *n*, (30) MHG *œ* before *n*, (31) MHG *üe* before *n*, (32) MHG *ei* before *n*, (33) MHG *ou* before *m*, (34) MHG *ou* before *b*, *ch*, (35) MHG *ou* before *f*
Vowels + *l*	(36) MHG *a* + *l*, (37) MHG *ë* + *l*, (38) MHG *ö* + *l*, (39) MHG *o* + *l*, (40) MHG *i* + *l*, (41) MHG *u* + *l*, (42) MHG *û* + *l*, (43) MHG *ei* + *l*, (44) MHG *uo* + *l*, (45) intervocalic MHG *-l(l)-*
Vowels + *r*	(46) MHG *â* + *r*, (47) MHG *a* + *r*, (48) MHG *a* + *r* before *t*, (49) MHG *e* + *r*, (50) MHG *o* + *r*
Unstressed vowels and syllables	(51) MHG *-en* following *n*, (52) MHG *-en* following *ch*, (53) MHG *-en* following *f*, (54) MHG *-en* following *g*, (55) MHG *-en* following *j*, (56) MHG *-el* following *b*, *f*, (57) MHG *-el* following *g*, (58) word-final MHG *-r*, (59) word-final MHG *-er,* (60) word-final MHG *-ere*, (61) word-initial MHG *ge-* before *b*, (62) word-initial MHG *ge-* before *w*, (63) word-final MHG *-e*, (64) MHG *-e-* in the intermediary syllable, (65) epenthetic vowel following MHG *l*, (66) epenthetic vowel following MHG *r*
Consonants: obstruents	(67) epenthetic *d* before MHG *-l-*, (68) intervocalic MHG *-nd-*, (69) MHG *-d-* before *-en*/*-em*, (70) word final MHG *-d* following *l*, (71) word initial MHG *t-*, (72) intervocalic MHG *-t-*, (73) intervocalic MHG *-b-*, (74) MHG *-b-* before *-en*, (75) word initial MHG *k~kch* before *l*, *n*, (76) intervocalic MHG *-ck-*, (77) word final MHG *k~kch* following *r*, (78) word final MHG *k~kch* following *l*, (79) word final MHG *-g*, (80) word final MHG *-g* in *-ig*, (81) MHG *-s-* following *-r-*, (82) MHG -s- before *-t*, (83) MHG *-h-* in intervocalic position, (84) MHG *-ch* from PGmc *h*, (85) MHG *-ch* from PGmc *k*
Consonants: sonorants	(86) word final MHG *-n*, (87) MHG *-n-* before word final *-f*, (88) word final MHG *-m* in *-em*, (89) word final MHG *-m* following *r*, (90) intervocalic MHG *-w-*

3.2. Ethnographic Data

The ethnographic data are based on the 'Austrian Ethnographic Atlas' (*ÖVA = Österreichischer Volkskundeatlas*; Burgstaller et al., 1959–1979). The ÖVA was released in six installments between 1959 and 1979 under the patronage of the Austrian Academy of Sciences. It comprises 117 sheets, not all of which are maps, accompanied by six detailed commentary volumes and a directory of research locations. These materials, including maps and commentaries, document the diversity, geographical distribution, and historical evolution of various elements of everyday culture. They cover topics such as local architectural styles, types of settlement, agricultural equipment, traditional costume and food, folk art, rites, customs, social and religious folklore, folk laws, and folk narratives. Additionally, the ÖVA contains sections on traditional dialects, presented both as dialectological overview maps and lexicological maps following the 'words and things' concept (Meringer, 1909). Notably, the scope of the ÖVA is narrowly focused on folk culture within rural farming communities. Additionally, many of the maps have a historical focus and do not depict everyday culture during the survey period (let alone everyday culture in the 21st century). As a result, the ÖVA cannot be employed to draw comprehensive conclusions about (today's) Austrian folk culture. Nevertheless, since the linguistic data also pertain to the most conservative forms of dialects in rural Austria, the ÖVA provides a useful point of comparison.

The data presented in the ÖVA draw from two primary sources: Firstly, they rely on a comprehensive questionnaire survey, methodologically akin to the Atlas of German Folklore. The survey covers approximately a quarter of all primary school locations in Austria. Secondly, the ÖVA incorporates maps derived from data directly provided

by the editors themselves, frequently originating from their own fieldwork. While the questionnaire-based maps are presented as point maps, the other maps are either point maps or area-class maps.

The following analyses are based on the data of 36 maps from the ÖVA, with all maps depicting linguistic phenomena excluded. This specifically pertains to lexicographical maps, such as those concerning names of agricultural equipment, customs, or mythical creatures. The present study, therefore, focuses only on non-linguistic aspects of folk culture and compares geographical patterns in this domain with phonological variation. While this considerably reduces the amount of cultural data, it has the advantage of clearly separating both fields of investigation. Apart from this, the selection of cultural phenomena was guided by a few other considerations: Firstly, maps pinpointing specific locations such as mining facilities, marksmen's clubs, or pilgrimage sites were left out. The same applies to maps illustrating outdated socio-demographic information like the percentage of the population engaged in agriculture or forestry. Furthermore, maps illustrating phenomena limited to specific regions of Austria were not included. For example, this pertains to the different maps detailing customs of Alpine farming, which are relevant only to those regions of Austria where Alpine farming is practiced in the first place. From the remaining maps, the selection aimed to capture a diverse range of phenomena, prioritizing those covering more general topics over those covering very specific ones. Table 2 shows the final selection of ethnographic variables.[12]

Table 2. Variable set, ethnographic data.

Housing and settlement	(1) historic rural village types, (2) historic types of agricultural land (*Flurformen*), (3) historic farmstead types
Agricultural equipment	(4) plough types, (5) harrow types, (6) flail types, (7) scythe types, (8) rake types
Clothing	(9) types of male costumes, (10) types of female costumes, (11) types of female headscarves, (12) types of female 'disc hats' (*Scheibenhüte*), (13) types of female 'ribbon and tassel hats' (*Bänder- und Quastenhüte*)
Food and drink	(14) solid meals for breakfast, (15) production of bread, (16) special regional types of schnapps, (17) festive pastries for Easter (as godfather gift)
Rites and customs	(18) types of carnival customs, (19) form of palm bushes on Palm Sunday, (20) 'Easter rattling' traditions (*Osterratschen*), (21) introduction of the maypole, (22) date for annual fire customs, (23) types of 'puppet burning' customs (*Puppenverbrennen*), (24) date for 'benediction branches' (*Segenszweige*), (25) helpers of St Nicholas, (26) preparation of food for St Nicholas' donkey, (27) introduction of the Christmas tree, (28) date for festive shootings at Christmas and New Year's Day, (29) 'fresh and healthy beating' customs (*Frisch- und G'sundschlagen*), (30) types of *Perchten* customs
Games and dance	(31) main forms of the *Ländler* folk dance, (32) main card games
Folk law	(33) weekday for traditional weddings, (34) patterns for farm succession, (35) *Ausgedinge* customs after farm succession, (36) dates for servants for starting/ending work relations (*Dienstbotentermine*)

The initial stage of data annotation involved identifying the nearest research location in the ÖVA dataset corresponding to each research location in the linguistic data (see Section 3.1). Typically, these research locations are neighboring villages, and occasionally, they are even identical. Following this, the variants of the 36 ethnographic variables mapped for these locations were manually identified and recorded. In most cases, the classification of variants adhered to that of the ÖVA. However, in cases where the ÖVA maps provided extensive detail, the mapped variants were grouped into main variants, guided by the commentary volumes of the ÖVA. Given that the ÖVA typically reports only

one variant per location, the data are predominantly categorical. Nonetheless, there are instances where the ÖVA denotes mixed areas or transition zones. In such cases, these locations were annotated as semi-belonging to each variant, coded as 0.5 (or even 0.3 in instances of a mixture between three variants). The next section will detail the process of further aggregating these data.

3.3. Statistical Analysis

Dialectometry investigates dialect variation by "using exact methods, especially computational and statistical approaches" (Wieling & Nerbonne, 2015, p. 244). To detect geographical patterns of dialect variation in multiple features, most dialectometric studies adopt an aggregative approach (e.g., Goebl, 2010; Szmrecsanyi, 2013; Lameli, 2013; Vergeiner, 2023). This approach involves computing the differences or similarities in dialect features between pairs of research locations to generate a site-by-site distance or similarity matrix. Various algorithms are available for aggregating the data, ranging from simple categorical difference counts to more complex distance measures such as the Levenshtein distance (Heeringa, 2004).

For data aggregation, the present study employed a modified version of Relative Distance Values (RDVs). RDVs are "calculated from the number of pairwise matchings (also called co-identities, COIs) [. . .] and the number of pairwise mis-matchings (co-differences, CODs)" (Goebl, 2010, p. 439) between all features (k) for any pair of locations (i, j) according to the following formula (adapted from Goebl, 2010, p. 439):

$$\mathrm{RDV_{ij}} = 1 - \frac{\sum_{k=1}^{n} \mathrm{COI(k)_{ij}}}{\sum_{k=1}^{n} \mathrm{COI(k)_{ij}} + \sum_{k=1}^{n} \mathrm{COD(k)_{ij}}} \quad (1)$$

While (1) can be used with categorical data, the linguistic and, to some extent, ethnographic data in this study are based on numerical data. Therefore, a straightforward count of matching and mis-matching forms is not feasible. Instead, relative co-identities were determined by aggregating the minimum frequencies (f) of each variant (k) across all pairs of locations (i, j). Subsequently, this value was subtracted from the total number of variables (n) to derive co-differences. The resulting value was then normalized by dividing it by the total number of variables, ensuring standardization between 0 and 1. Thus, the following formula was utilized to compute the revised Relative Distance Values (rRDVs):

$$\mathrm{rRDV_{ij}} = \frac{\mathrm{n} - \sum_{k=1}^{n} \min(\mathrm{f_{ik}}, \mathrm{f_{jk}})}{\mathrm{n}} = 1 - \frac{\sum_{k=1}^{n} \min(\mathrm{f_{ik}}, \mathrm{f_{jk}})}{\mathrm{n}} \quad (2)$$

A value of 0 signifies complete similarity (identical variants with identical frequencies across locations), whereas a value of 1 indicates complete dissimilarity (no shared variants between locations). For categorical variables (where a variant's presence is dummy-coded as 1 and its absence as 0), this method yields the same outcome as the Relative Distance Values calculated from Formula (1). When applied to relative frequencies, it corresponds to the well-established Manhattan distance (Backhaus et al., 2021, pp. 462–464) divided by 2 and the number of variables.[13]

The aggregated distances served as the basis for all subsequent statistical analyses, including multidimensional scaling (MDS) and cluster analysis (CA). In dialectometry, both methods are complementary (Vergeiner, 2023): MDS is frequently used to display dialect continua, whereas CA groups locations into distinct clusters, which can be interpreted as dialect areas (e.g., Szmrecsanyi, 2013; Lameli, 2013).

MDS allows for the visualization and analysis of relationships between objects based on their pairwise similarities or dissimilarities. It aims to represent high-dimensional data in a lower-dimensional space, typically two or three dimensions, while preserving the original

distances between objects as much as possible (e.g., Borg et al., 2018). In dialectometry, it is most common to use a three-dimensional MDS solution, since it can be easily mapped by associating each dimension of the MDS space with a color in the RGB (red, green, blue) color space. Each location is then colored as a blend of these colors, depending on its coordinates in the MDS space (Nerbonne et al., 1999). For the current analysis, an (interval) MDS based on stress minimization using majorization was employed, computed with the *mds* function from the R package (version 4.4.2) *smacof* (Mair et al., 2022).

CA aims to form clusters, where objects within each cluster exhibit high similarity (intra-group homogeneity) while demonstrating significant differences between clusters (inter-group heterogeneity) (Backhaus et al., 2021, pp. 452–454). In this study, hierarchical agglomerative CA was utilized, offering the additional advantage of revealing vertical relationships between (groups of) locations. The clustering algorithm employed was WPGMA (Weighted Pair Group Method with Arithmetic Mean).[14] To address potential instability in CA and assess the robustness of clusters, a bootstrapping approach was applied (cf., also Nerbonne et al., 2008). For computation, the *hclust* function from the R package *stats* (R Core Team, 2013) and the *clusterboot* function from the R package *fpc* (Hennig, 2007) were used.

4. Results

As detailed in the preceding section, distance matrices for two types of data were computed in this study: one for linguistic data and one for ethnographic data. The following section will compare these matrices and explore their basic statistical properties (Section 4.1). Subsequently, the geographical patterns in the linguistic (Section 4.2) and ethnographic data (Section 4.3) will be examined.

4.1. Linguistic Versus Cultural Distances

Table 3 provides key statistics from the two distance matrices, while Figure 5 displays the distribution of the two datasets.

Table 3. Basic statistics of the linguistic and cultural distances.

	Median	Mean	Sd	Minimum	Maximum	Skewness	Kurtosis
linguistic distances	0.37	0.39	0.17	0.05	0.78	0.24	−0.84
cultural distances	0.59	0.56	0.15	0.10	0.87	−0.66	−0.15

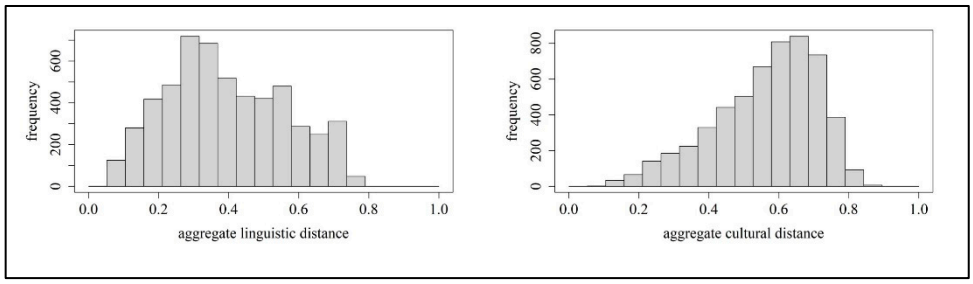

Figure 5. Distribution of the linguistic distances (**left**) and the cultural distances (**right**).

The linguistic and cultural distances differ greatly in their basic statistical properties. The median and mean values for the cultural distances significantly exceed those for the linguistic distances, indicating that the research locations exhibit greater similarity in linguistic variation than in the cultural one. The skewness values add to this finding: the linguistic data show a slight right-skew, suggesting more locations with distances below the mean, while the cultural distances display strong left-skewness, with many observations

having distances higher than the mean (see Figure 5). In terms of kurtosis, both distributions are platykurtic, indicating fewer extreme values than a normal distribution. However, this characteristic is more pronounced in the linguistic distances.

The linguistic and cultural distances can also be directly mapped onto each other, as shown in Figure 6, where the left scatter plot visualizes the correlations between linguistic and cultural distances. At first glance, a notable correlation becomes apparent: As linguistic distances increase, so do cultural ones. However, this finding must be contextualized due to a crucial confounding factor: geographical distance. According to the famous 'First Law of Geography', nearby locations are expected to be more similar, and it can be anticipated that this principle holds true for both linguistic and cultural features (for dialect variation, cf., e.g., Nerbonne, 2010, 2013). This is further demonstrated in Figure 6, where the central scatterplot illustrates the correlation between geographical distance (measured as the crow flies) and linguistic distance, while the right scatterplot depicts the correlation between geographical distance and cultural distance.

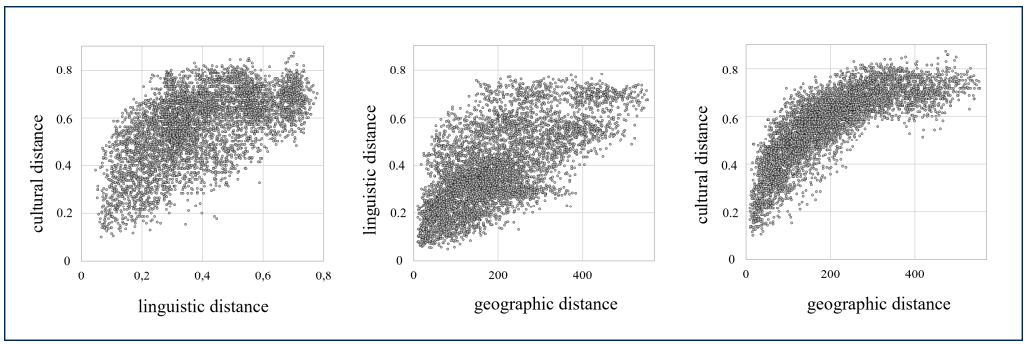

Figure 6. Correlations between linguistic and cultural distances (**left**), linguistic and geographical distances (**center**), and cultural and geographical distances (**right**).

The linguistic and cultural distances differ notably in their relationship to geographic distance: The ethnographic data follow a much more pronounced logarithmic pattern, with values surging rapidly before plateauing beyond a certain threshold. In contrast, the linguistic distance values demonstrate a more gradual increase, suggesting that cultural relations are more small-scale compared to linguistic ones. Additionally, the linguistic distance values exhibit a higher prevalence of outliers—instances where geographical distances are relatively short, yet linguistic differences are great. This indicates the presence of breaks in the continuum.

To assess the correlations, mantel tests were performed (using the functions *mantel* and *mantel.partial* from the *R* package *vegan*; Oksanen et al., 2022). Without controlling for the effects of geographical distance, a moderate correlation (r = 0.59) is observed between linguistic and cultural distances. However, this correlation diminishes considerably (r = 0.13) when the effects of geographical distance are controlled.[15] This outcome is not unexpected, considering the substantial correlations between geographical distance and both linguistic (0.68) and cultural distance (0.78). The latter correlation becomes even stronger when using the logarithm of geographic distance (0.85).

The results of this section have indicated notable differences between the linguistic and cultural data. This will be further examined in the following sections, where the geographical patterns in both types of data will be analyzed in greater detail.

4.2. Geographical Patterns in the Linguistic Data

In this section, the geographical patterns of the linguistic data will be examined, starting with the outcomes of the MDS analysis before considering the CA. Figure 7

presents the three-dimensional MDS solution (stress-1 = 0.07). For enhanced visibility, an area-class map was created using Voronoi partitioning.

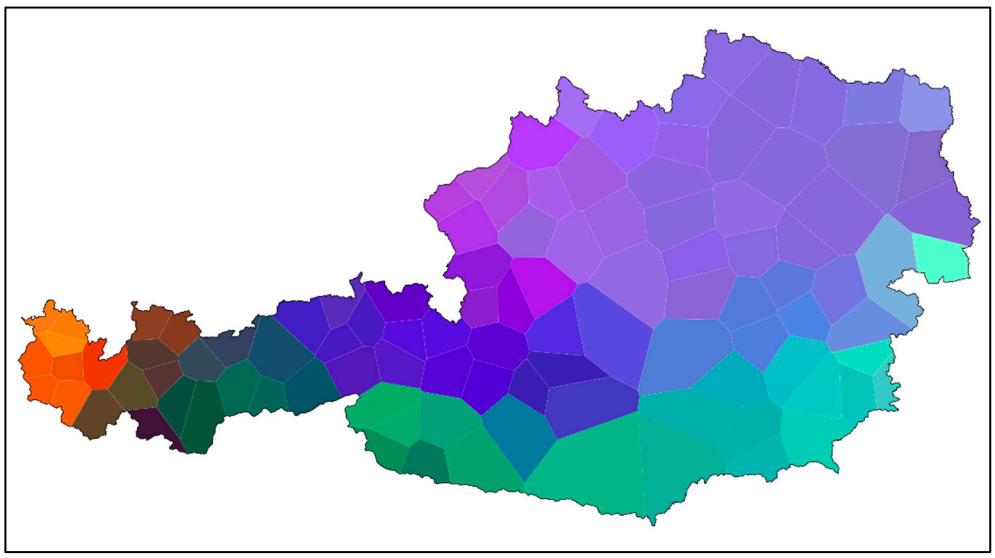

Figure 7. Three-dimensional MDS solution for the linguistic data.

As noted in Section 3.3, MDS is particularly suitable for detecting dialect continua and potential breaks within them (Vergeiner, 2023). Figure 7 illustrates these dialect continua, particularly in the eastern half of Austria. However, it also reveals discernible geographic patterns that closely align with the traditional dialect classification outlined in Section 2.2:

Beginning with the westernmost areas, the Alemannic locations in Vorarlberg stand out distinctly with their orange coloring. Moving eastward, the transition zone between Bavarian and Alemannic dialects is depicted in various shades of brown and green-brown. The South Bavarian dialects in Tyrol, Carinthia, and Styria are represented in shades of green, ranging from lush green in the west to lighter green and cyan in the east. Central Bavarian in northern Salzburg and Upper and Lower Austria appears in shades of purple, with darker tones in the west transitioning to lighter shades in the east. The South-Central Bavarian transition zone is less distinct: while its western half is depicted in dark blue, its eastern regions blend somewhat with adjacent areas of purple or green.

The results of the CA also indicate a significant overlap with the traditional dialect classification. Figure 8 depicts the results of the CA (cophenetic correlation coefficient = 0.91), illustrating solutions with two to six clusters. The numbers on the maps represent cluster stability for each solution, based on bootstrapping (see Section 3.3). Stable clusters should have stability values above 0.75, whereas clusters with values below 0.6 are deemed unreliable.[16]

As might be expected, the two-cluster solution distinguishes the Alemannic dialects in Vorarlberg from the Bavarian dialects in the rest of the country. In the three-cluster solution, the South Bavarian locations in Tyrol, Carinthia, and Styria, including the Bavarian-Alemannic transition zone, separate from the other Bavarian dialects. The four-cluster solution shows the southeastern parts of South-Central Bavarian breaking away from the larger Bavarian group, albeit with limited cluster stability. The Bavarian-Alemannic transition zone becomes apparent in the five-cluster solution. Finally, in the six-cluster solution, the western half of South-Central Bavarian forms its own cluster, although this cluster is not particularly stable.

Ultimately, it can be concluded that, aside from some minor differences, these dialectometric results generally confirm the common dialect classification of Austria presented in earlier works such as Wiesinger (1983) and Kranzmayer (1956) (for a similar finding

with other data, see, e.g., Vergeiner & Bülow, 2023). The most notable difference concerns the northeastern parts of South-Central Bavarian, which appear to have converged with Central Bavarian, maybe due to language change (for a more comprehensive discussion, see Stöckle & Vergeiner, 2025).

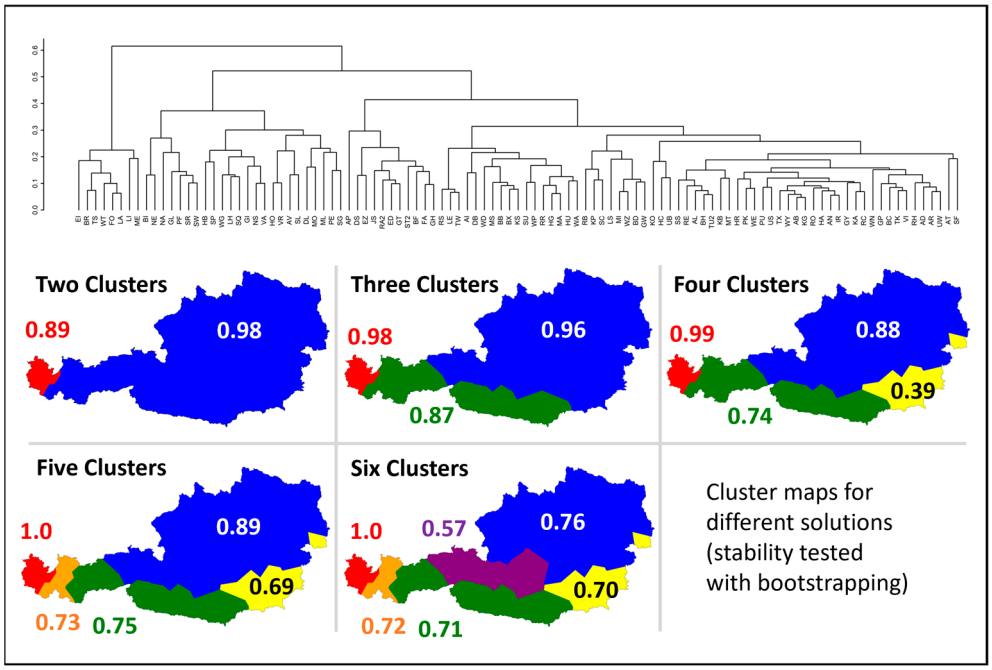

Figure 8. Cluster analysis for the linguistic data with solutions for two to six clusters.

4.3. Geographical Patterns in the Ethnographic Data

In this section, the geographical patterns in the ethnographic data will be examined. Figure 9 presents the three-dimensional MDS solution (stress-1 = 0.1) for these data.

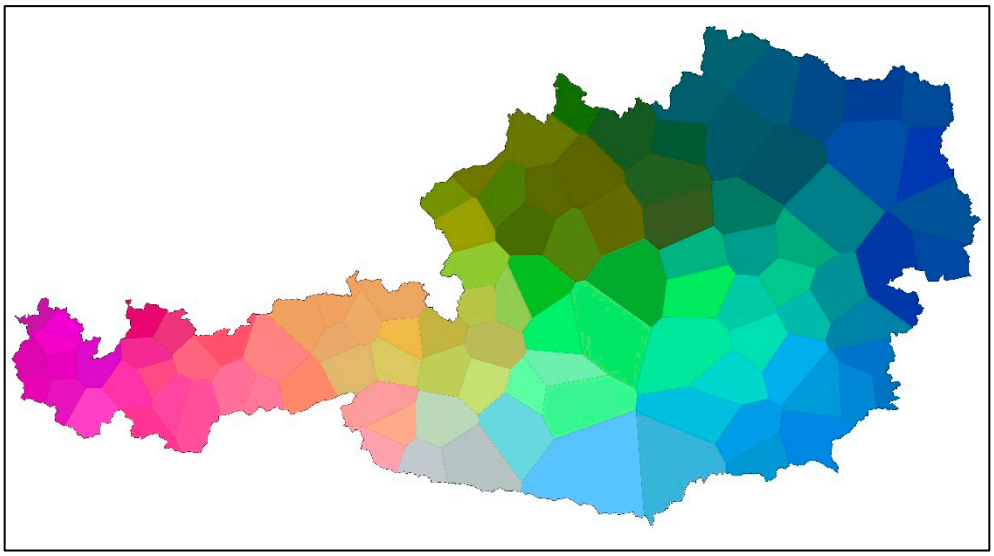

Figure 9. Three-dimensional MDS solution for the ethnographic data.

The MDS analysis also reveals certain geographic patterns in the ethnographic data; however, these patterns deviate greatly from those found in the linguistic data. Specifically, the cultural patterns appear much more fragmented and fuzzier. Only a vague distinction is visible among locations in the west (purple, pink), the south (gray, light blue) and east (dark

blue, blue-green), the central region (light green), the western central region (yellow-green, orange), and the northern central region (dark green, brown). Importantly, none of these patterns align with those identified in the linguistic data, although in a few instances, there are corresponding breaks in the continuum, such as in the Tyrolean Unterland (pink vs. orange).

The results of the CA (cophenetic correlation coefficient = 0.74) confirm this finding, as indicated by Figure 10.

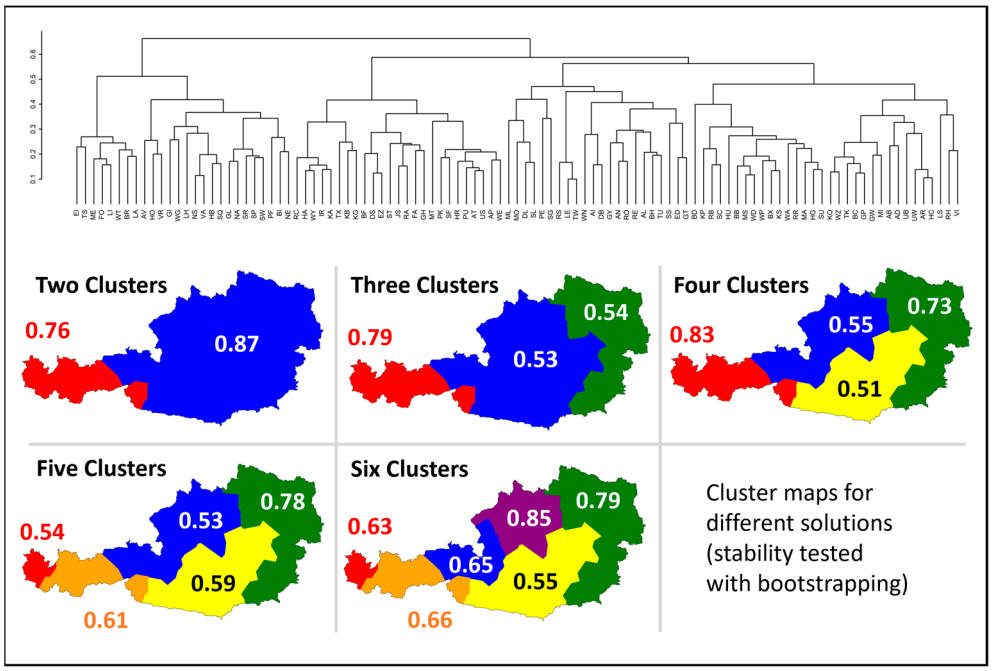

Figure 10. Cluster analysis for the ethnographic data with solutions for two to six clusters.

In the two-cluster solution, the western locations in Vorarlberg and Tyrol (except for the Tyrolean Unterland) are separated from the rest of the country. Next, the large eastern area is split into two parts: one in the center and one in the east. In the four-cluster solution, the central cluster is divided into a northern and a southern half. The locations in Vorarlberg are separate from the Tyrolean locations in the five-cluster solution, while in the six-cluster solution, the northern central region is split along the border between Salzburg and Upper Austria. Notably, however, most of these clusterings are rather unstable and not very reliable. The CA nevertheless supports the conclusion that the overlap with the geo-linguistic patterns is rather limited.

5. Discussion

Viewing dialect areas as cultural areas is a popular belief in dialectology. Particularly in the first half of the 20th century, the relationship between geographical patterns in dialect variation and other elements of everyday culture (e.g., traditional clothing, religious customs, local construction methods) received much attention (e.g., Aubin et al., 1926; Maurer, 1931; Bach, 1937; see Section 2.1). While this early research was qualitative and focused on individual isoglosses and isolated features, the advent of quantitative, dialectometric methods now allows us to revisit the interplay between language and folk culture with more data and greater objectivity (Wieling & Nerbonne, 2015). Interestingly, however, there are no such studies, at least none known to the author of this paper (for a general overview of dialect variation and culture, see, e.g., Lameli, 2014, 2019). The aim of this study was to address this desideratum by comparing the geographical patterns of

90 phonological variables with 36 non-linguistic ethnographic variables. The linguistic data stem from the project 'German in Austria', while the ethnographic data were derived from the 'Austrian Ethnographic Atlas' (ÖVA, Burgstaller et al., 1959–1979). Both datasets have been aggregated and analyzed using the same statistical methods.

The results showed only limited overlap between the linguistic and ethnographic data. First, the ethnographic data seem to be much more small-scale than the linguistic data. Although both the aggregated linguistic and cultural distances are greatly influenced by geographical distance, mere geographical proximity appears to be a better predictor of cultural similarity than of linguistic similarity. Importantly, when controlling for the effects of geographical distance, only a very weak correlation remains between linguistic and cultural distances.

Multidimensional scaling (MDS) and cluster analysis (CA) revealed clear geographical patterns in the linguistic data, closely aligning with the traditional dialect classification (Kranzmayer, 1956; Wiesinger, 1983). The analyses reproduced the common distinctions between Bavarian and Alemannic, as well as between South Bavarian and Central Bavarian. Additionally, transition zones between these dialect areas could be identified.

For the ethnographic data, different geographical patterns emerged, which appear less distinct and more fragmented. Although some cultural and linguistic boundaries seem to overlap (e.g., in eastern Tyrol), there is hardly any instance where the cultural and linguistic areas clearly coincide. Importantly, neither the major difference between Alemannic and Bavarian nor the difference between South Bavarian and Central Bavarian is clearly mirrored in the ethnographic data. Instead, several small-scale regions emerged.

These findings corroborate earlier qualitative studies, which not only revealed the difficulty in discerning clear geographical clustering for everyday culture (Cox & Zender, 1998, p. 169) but also identified limited overlap between the distributions of individual dialect features and other aspects of everyday culture (Grober-Glück, 1982, pp. 97–98; Lameli, 2019, p. 571). Nevertheless, the results are somewhat surprising. Intuitively, one would assume that "language is integrated into a broad spectrum of societal phenomena" (Mattheier, 1986, p. 104) and that differences in "other cultural domains should be reflected in language differences" (Falck et al., 2012, p. 233). Why did the results of this study fail to match this expectation?

First, it is important to note that the results do not contradict the idea that language is an integral part of culture. Instead, they indicate a more nuanced and complex relationship between language—more precisely, dialect phonology—and certain non-linguistic aspects of rural culture. This complexity is intertwined with the different historical developments of both linguistic and folk cultural phenomena. Specifically, the major dialect distinctions in Austrian dialect phonology emerged during the Middle Ages (see Reiffenstein, 2003, pp. 2927–2929), with Kranzmayer (1956, p. 6) even suggesting that all significant phonological processes for the subdifferentiation of the Austrian dialects were completed by the year 1300. In stark contrast, numerous folk cultural phenomena documented in the ÖVA trace back to later periods of (Early) Modern Times. Consequently, they were shaped by very distinct historical circumstances (different territorial borders, regional centers, trade routes, etc.). In addition, other factors may exert distinct influences as well, for instance, environmental factors. While physical geography primarily shapes linguistic variation by facilitating or hindering contact, its impact on cultural phenomena is more immediate. For example, housing styles or types of agricultural equipment are closely tied to local materials, available space, prevailing soil, or climate conditions.

Another reason for the finding that dialect phonology exhibits both clearer and less fragmented geographical patterns might be that phonological variables are more tightly interconnected than those selected for everyday culture. The phonological features are not

only part of an inter-related linguistic system,[17] but specific variants often emerge from the same underlying changes, including chain shifts or so-called *Reihenschritte* (cf., e.g., Vergeiner et al., 2021). For example, in Bavarian, all long high vowels were affected by early New High German diphthongization, whereas many Alemannic dialects retained these long high vowels. In Central Bavarian, most intervocalic plosives and fricatives were influenced by consonant lenition, and all vowels followed by MHG *l* underwent *l*-vocalization. It is very likely that the systematic and regular nature of these changes contributes significantly to the clear-cut geographical patterns observed in phonological variation.

As a result, one must be cautious not to overgeneralize the findings. This study only compared phonological variation with non-linguistic aspects of everyday culture in rural Austria. It cannot be ruled out that other linguistic levels, such as lexis, might relate differently to geographical patterns in everyday culture, as the geo-linguistic structures of dialect phonology cannot be equated with those of other linguistic levels. Birkenes and Pheiff (2022), for example, demonstrate that geo-linguistic patterns in phonology differ significantly from those in morphology and lexis, while Birkenes and Fleischer (2021) observe notable differences between syntax and phonology. Dialectometric analyses of morphology and syntax, conducted with a subsample of the data from this study (40 locations instead of 105), also indicate differences across linguistic levels (see Vergeiner, 2023; Vergeiner et al., in press). It is worth noting, however, that the geographical patterns identified in these studies on dialect morphology and syntax in Austria also diverge substantially from the geographical patterns of everyday culture uncovered in this study. At least for lexical variation, however, such a comparison remains a major desideratum, particularly since the greatest correspondence with the non-linguistic ethnographic variables is expected for this linguistic level. Certain phenomena of lexical variation (e.g., terminology for tools, foods, animals, etc.) might even be considered an important part of everyday culture itself, as the strong focus on this type of variation in the ÖVA indicates. By excluding lexical phenomena and focusing solely on phonological variation and non-linguistic aspects of folk culture—potentially representing two extreme points of comparison—this study may have accentuated the differences between linguistic and cultural data.

There are also other methodological issues arising from the ethnographic dataset used in this study. First, the data in the ÖVA were derived from various survey methods and collected during an earlier period.[18] In addition, the selection of cultural variables used in this study was relatively small and heterogeneous, which may have contributed to the fragmented patterns observed in the cultural data. A larger, more homogeneous dataset might have revealed broader geographical patterns that better align with the linguistic data.[19] It is also important to emphasize that the data mapped in the ÖVA primarily account for very specific aspects of folk culture within rural farming communities, and in some cases, the maps depict phenomena that were already outdated at the time of the survey (let alone in the 21st century). Consequently, the areal patterns identified in Section 4.3 represent, at best, a very rough approximation of the 'true' geographic differences in traditional Austrian rural culture. For future studies, a comparison of contemporary everyday language with contemporary everyday culture could be a worthwhile project for interdisciplinary research, bringing together linguistics and ethnography.

Despite these limitations, the results of this study highlight the complex relationship between linguistic variation and other cultural phenomena. It suggests that linguistic phenomena have their unique characteristics, also in relation to geographical space. Caution is advised when extrapolating from dialect areas to other cultural phenomena.

Funding: The research for the present article was conducted within the framework of the project 'Variation and Change of Dialect Varieties in Austria (in Real and Apparent Time)', which is funded by the Austrian Science Fund (F 6002-G23) as part of the Special Research Program 'German in Austria' (F 60).

Institutional Review Board Statement: Ethical review and approval were waived for this study because it did not involve new data collection but analyzed already existing data.

Data Availability Statement: Relevant data and supporting materials for this study are made available on OSF under the following URL: https://osf.io/whtse/?view_only=13676ea27fcc484c8c0fac785ae0ea8d (accessed on 5 January 2025).

Conflicts of Interest: The author declares no conflicts of interest.

Notes

1 See, however, also other approaches such as Wrede's 'social linguistics' (*Soziallinguistik*, cf., e.g., Wrede, 1919) or the 'words and things' concept (*Wörter und Sachen*, cf., e.g., Meringer, 1909).

2 German original: "daß Sprachgrenzen Kulturgrenzen, Sprachräume Kulturräume sind".

3 German original: "daß Sprache eingebunden ist in ein großes Sprektrum von gesellschaftlichen Erscheinungen, die gemeinsam einen regional-historisch verorteten Sozialhandlungsraum bilden und sich nur in enger Abhängigkeit voneinander [. . .] wandeln".

4 German original: "Abstraktionen konkreter oder gegebenenfalls auch nur als konkret angenommener räumlich gebundener Traditionen und tradierter Erfahrungen".

5 German original: "ein durch die sich gegenseitig stabilisierenden, ähnlich gerichteten Raumabstraktionen bedingtes, keineswegs einheitlich konsistentes Konstrukt, an dem sich gleichwohl reale Handlungen [. . .] ausrichten".

6 See Hilfskarte 1 in Kranzmayer (1956).

7 All maps in this article were generated with the software REDE SprachGIS, version 2.1.7, available under the following URL: regionalsprache.de/SprachGIS/Map.aspx (accessed on 5 January 2025).

8 The federal states of Upper Austria and Lower Austria have their origins in the Principalities above and below the Enns, which also formed Austria's historic heartland. Carinthia originated from the Duchy of Carinthia, Styria emerged from the Duchy of Styria, and Tyrol evolved from the Princely County of Tyrol. All three territories came under the rule of the Habsburgs during the Late Middle Ages. The federal state of Vorarlberg comprises territories acquired by the House of Habsburg during the 14th and 15th centuries. Salzburg corresponds to the former Prince-Archbishopric of Salzburg, which remained formally independent from Austria until the end of the Napoleonic wars. Today's Burgenland was part of Hungary until 1921.

9 Note that during the Late Medieval and Early Modern periods, the Austrian *Erblande* were divided into three major parts, each temporarily governed by different branches of the Habsburg family: *Austria Inferior* (*Niederösterreich*) in the north, *Austria Interior* (*Innerösterreich*) in the south, and *Austria Superior* (*Oberösterreich*) in the west.

10 The complete list of research locations is provided in the Supplementary Material on OSF.

11 For more detailed information on the annotated lexemes, token counts, and variants annotated per variable, see the Supplementary Material on OSF.

12 For more detailed information on these variables and their variants, see the Supplementary Material on OSF.

13 The distance matrices can be found in the Supplementary Material on OSF.

14 WPGMA was selected over other algorithms (e.g., the commonly used Ward algorithm) due to its better correspondence with the original distance matrices, as demonstrated by its higher cophenetic correlation. Additionally, the bootstrapping results indicated greater cluster stability with WPGMA. However, although the specific details differ, the overall outcomes of the various algorithms are broadly similar.

15 This was performed by using a partial mantel test. It must be mentioned, however, that this test, in particular, and the mantel test, in general, have faced criticism in recent years (see Guillot & Rousset, 2013). Therefore, the reported r-values must be taken with a grain of salt.

16 Cf., https://www.rdocumentation.org/packages/fpc/versions/2.2-11/topics/clusterboot (accessed on 5 January 2025).

17 Note, however, that cultural features are sometimes also considered systematic in the structuralist sense (e.g., Amborn, 1992).

18 However, it should also be noted that the linguistic data used in this study reflect the most conservative form of today's dialects in Austria, and the geo-linguistic patterns derived are highly comparable to those from a century ago (Stöckle & Vergeiner, 2025).

19 Note that for phonological variables, however, a much smaller dataset is sufficient to yield patterns very similar to those obtained in this study (see Vergeiner & Bülow, 2023; Stöckle & Vergeiner, 2025).

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