

Deconfounding the effects of competition and attrition on dialect across the lifespan: a panel study investigation of Swabian German

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Abstract

Lifespan dialectal changes in individuals are typically seen as reflecting the attritional effect of standard languages on native dialects. However, particularly relevant to lifespan studies of dialect usage is the observation that the distributional properties of natural languages guarantee that the lexical knowledge of individuals increases continuously throughout their lifetime and that the overwhelming majority of lexical types any individual knows are rare and often unknown by other speakers. These considerations suggest an alternative account of the changes in individual speech patterns across the lifespan: that is, the increased influence of later acquired, usually non-dialect, lexical knowledge on speakers' vocabulary choice, not the "loss" of dialect itself. Consistent with this view, an analysis of the speech of 20 speakers of the southwestern German dialect, Swabian, recorded in 1982 and again in 2017, reveals that rather than "lose" dialect over the course of their lifetime, speakers acquire a vast amount of non-dialectal vocabulary reflecting experiences gained in later life. Within the set of relatively high-frequency words sampled in this study, the least frequent dialect forms, rather than being lost, have become slightly more frequent 35 years later, a finding that supports the enduring role that dialect plays across the lifespan.

Keywords: lexical frequency, lifespan change, language change, ageing, dialect contact, dialect attrition, standard language, dialect identity.

¹ Authors are presented in alphabetical order to represent the collaborative nature of this research.

Introduction

Rising mobility, increasing levels of education, and intensifying immigration are bringing more diverse people into more frequent contact with more prolonged interaction (Auer 2007; Britain 2013, 2016; Britain and Trudgill 1999; Dodsworth 2017; Trudgill 1992). These factors, coupled with continuing globalisation and ubiquitous social media, push standard languages into the forefront of people's experience and relegate non-standard varieties to the background. As a consequence, a growing body of research suggests that dialects, i.e., non-standard language varieties, are receding across the globe. Nowhere is this more evident than in Europe, notably Germany (Auer 2005, 2018; Auer, Baumann, and Schwarz 2011; Auer and Spiekermann 2011; Kehrein 2012; Pedersen 2005; Schmidt 2011; Streck and Auer 2012).

Dialectologists measure changes in the use of dialect-specific words (e.g., Swabian *Grombiere* versus standard German *Kartoffel* 'potato'), variationists study changes in the frequencies of various phonological and morphosyntactic variants (e.g., Alemannic *Fescht* versus standard German *Fest* 'party'), and corpus/computational linguists examine changes in frequencies between different word forms (e.g., vernacular *geh* versus standard German *gehe* 'go'). Cumulatively, the results of these metrics show that when different language varieties come into contact, accommodation occurs, and most commonly, it is the more prestigious variety that "wins" (Britain and Trudgill 1999; Giles, Taylor, and Bourhis 1973; Trudgill 1986). Indeed, this pattern is also seen in individuals: adult speakers appear to "lose" dialect as they age as they develop greater awareness of and experience with the standard language, gained through their participation in varied educational, commercial, and public institutions (Eckert 1997; Labov 1964; D. Sankoff and Laberge 1978).

The idea of dialect attrition is the dominant view in interpreting these patterns of language development. However, this position builds on the assumption that the standard language is encroaching on the dialect, such that, at the lexical level, dialect words are replaced by their standard counterparts, resulting in the attrition of the

vocabulary available to speakers of the dialect. There are two main problems inherent in this assumption that are particularly relevant to lifespan studies of dialect usage.

First, the distributional properties of natural languages ensure that the lexical knowledge of healthy individuals increases continuously across the lifespan. These same distributional properties also guarantee that the majority of lexical types any individual knows are relatively rare and that many of these types will be shared only with subsets of the wider community. As people age, their knowledge expands as they experience new things (e.g., in schools, on the job, with leisure activities), face various new life events (e.g., graduation, marriage, childbirth, divorce), and tackle new challenges (e.g., driving a fork-lift, climbing Kilimanjaro). In the course of these undertakings, speakers encounter new words and add them to their vocabulary. Many of these new words are specific to specialised areas of knowledge, such as medicine, plumbing, or linguistics, and are not in the vocabularies of other speakers in the community. In an increasingly technology-driven world, this increased lexical knowledge may involve words for new inventions and technologies (e.g., *cell phone*, *fax*, *emoji*). Importantly, it is likely that many of the specialisation-specific words, as well as words for cultural innovations, will have the same form in both the dialect and the standard language.

Second, the social settings for which the standard language or the dialect are appropriate often differ substantially. A rural dialect is lexically strong for discussing traditional methods of farming and socially appropriate for informal interactions with family and friends in the local community. The standard language comes into its own for interactions with speakers of differing backgrounds or to cover topics for which the dialect does not offer the relevant specialised words. These two considerations thus suggest an alternative account of the changes in individual speech patterns across the lifespan: that they represent, to a considerable extent, the increased influence of later acquired, standard language lexical knowledge and not the “loss” of dialect itself.

THE HYPOTHESES

Accordingly, in this study, we put forth three hypotheses:

- (1) rather than lose dialect, speakers gain a massive amount of new lexical knowledge throughout their lifetime that is not dialect;
- (2) dialect forms are more entrenched than words from the standard language; and,
- (3) speakers use more dialectal forms where context makes early experiences more relevant and fewer dialectal forms where context renders later life experiences more applicable.

THE CURRENT STUDY

Consequently, this study investigates richness in word use for dialect and standard language across the lifespan. Our investigation is positioned at the intersection of the fields of dialectology (dialect contact and attrition studies), sociolinguistics (longitudinal variationist and identity studies), psycholinguistics (lexical frequency studies), and psychology (ageing and cognition studies). In what follows, we first describe the corpus we used and then explain the methodology we employed, followed by a presentation of the results of our analyses. We conclude with a discussion of the implications of our findings for further research.

Methodology

CORPUS

The corpus for this investigation comprises casual, semi-structured sociolinguistic interviews with 20 speakers of Swabian, a high-Alemannic dialect spoken in southwestern Germany. Each speaker was interviewed twice, once in 1982 and again in 2017, for approximately an hour, although the interviews in 2017 tended to be somewhat longer. Local native Swabian speakers were selected as interviewers, matched in 1982 and 2017 for similar social characteristics (i.e., same age group, gender, educational level). The interviews followed a Labovian-style sociolinguistics questionnaire (Labov 1984), covering questions about the speakers' childhood, games,

leisure activities, family, friends, and the Swabian language and culture. If speakers wandered off the topic, the interviewer did not interrupt them immediately, with the aim of obtaining more natural, unmonitored speech. The overall goal was to create similar interview situations for all speakers in both time periods.

The corpus comprises two different speech communities, providing the opportunity to investigate changes in dialect use between an urban and a semi-rural setting. Stuttgart is a large urban centre with 630,000 inhabitants, and Schwäbisch Gmünd is a typical mid-sized, semi-rural town of 60,000 inhabitants. Seven speakers are from Stuttgart, four men and three women, and 13 from Schwäbisch Gmünd, seven men and six women. Most speakers are of the same age group (18-25 in 1982 and 53-60 in 2017) and socioeconomic status (middle class); 14 of the 20 speakers were students in 1982 who completed their *Abitur*, the German college preparatory exam. Four speakers were in their late 40's to early 50's in 1982, and hence in their 80's in 2017.

Transcriptions were completed in ELAN (Wittenburg et al. 2006) by native German speakers, students at the University of Tübingen. The 20 interviews totalled just over 18 hours in 1982 and just over 24 hours in 2017. A standard orthography was developed for easily and clearly transcribing specific dialect forms. All transcripts were verified by the principal investigator (Beaman) to ensure that standards were followed and to neutralise transcriber bias. All words (delineated by punctuation marks or blanks) were extracted, and forms were identified as Swabian, Vernacular or Standard. Swabian-specific forms were tagged with a code indicating one of 30 dialect variables under investigation. Vernacular forms were identified as any form differing from the standard German form. For example, with the verb *haben* 'to have', *habe* is identified as the Standard form, *hab* as the Vernacular variant (with the reduction of the final 'e'), and *han* as the Swabian variant (an irregular verb in the dialect). Because this investigation aims to look at overall dialect usage across the lifespan, we grouped the Vernacular and Swabian-specific forms together (henceforth called, "dialect" forms) in order to contrast them with the standard German forms.

The vocabulary of the corpus was divided into two subsets, dialect words (n=22,401 in 1982 and n=20,795 in 2017) and standard words (n=50,149 in 1982 and n=69,619 in 2017). Dialect words make up less than a third (30.9%) of the speakers' actively used vocabularies in 1982, dropping to less than a quarter (23.0%) in 2017. As our results will later show, this apparent dialect attrition stands in stark contrast with the exceptional growth of the standard vocabulary between 1982 and 2017 (27.9%).

SOCIAL PREDICTORS

Four social predictors were considered in this study:

- two recording years, i.e., 1982 and 2017;
- two speech communities, i.e., Stuttgart and Schwäbisch Gmünd;
- two education levels, i.e., with *Abitur* 'German college preparatory exam' and without; and,
- Swabian orientation, i.e., a five-point scale from 1 (lowest) to 5 (highest).

Following the model developed by Hoffman and Walker (2010) to measure the degree of Ethnic Orientation (EO), a Swabian Orientation Index (SOI) was derived for each speaker based on their answers to 16 questions posed in the interview. The questions covered attitudes to the Swabian culture and language, knowledge of Swabian icons and markers, participation in Swabian events, and the nature of linguistic interactions with Swabian and non-Swabian friends and family. The speakers' answers were evaluated on a five-point scale and averaged to create an overall score for each speaker in each year, from one for the lowest to five for the highest Swabian orientation (see Beaman 2018 for further details).

TYPES AND TOKENS

In what follows, we use WORD TYPE to refer to any unique word, a string of letters delineated by spaces and/or punctuation marks in the transcript, and WORD TOKEN refers to any instance of a specific WORD TYPE that occurs or reoccurs in the transcript regardless of its identity. For each transcript, TEXT LENGTH is measured by the number of WORD TOKENS, while VOCABULARY SIZE is measured by the number of WORD TYPES. No

lemmatisation was carried out; thus, for example, if a speaker uses the present and past tense of the same verb, they count as two different WORD TYPES. In 1982, the 20 interviews consisted of 17,707 TYPES and 72,560 TOKENS, and in 2017, the 20 transcripts contained 17,134 TYPES and 90,414 TOKENS. Of the roughly 17,000 WORD TYPES in each recording year, more than half (11,688 in 1982 and 11,337 in 2017) occurred only once, emphasising one premise of this research: that many of the words speakers use are indeed quite rare. Speakers tend to use words specific to their particular areas of interest and experience, and the overlap between speakers is quite small.

VOCABULARY GROWTH

The simplest measure for investigating differences in word use between texts is the size of the vocabulary (Baayen 2001). However, vocabulary size is dependent on text length, which, for the present study, is the length of the interview. Quite naturally, the longer the interview, the greater the opportunity for the speaker to utter a new word. Simple ways to sidestep this problem are to either base the analysis on a comparison of texts that are the same length or to plot interpolated VOCABULARY GROWTH CURVES side-by-side for texts of differing lengths (Baayen 2008). Due to the nature of our spontaneously spoken sociolinguistic interviews, we chose the latter approach.

VOCABULARY GROWTH CURVES are projected by counting the number of TOKENS within equally spaced measurement points throughout the text (referred to as TOKEN TIME) and graphing the corresponding count of WORD TYPES. This curve depicts how the vocabulary increases throughout the text (i.e., the sequence of interviews), which is typically quite steep at first and then flattening as more and more different WORD TYPES are encountered. By plotting two VOCABULARY GROWTH CURVES side-by-side, core properties of the different dynamics between TYPES and TOKENS become available for visual inspection and statistical evaluation.

STATISTICAL METHODS

In calculating VOCABULARY GROWTH CURVES for heterogeneous collections of texts, the question arises on how to order the texts. Our interviews comprise data sampled

from both talkative and taciturn speakers, and there is no natural order by which the interviews can be arranged. As we did not want to disrupt the syntactic and discursive structure of the interviews, we decided to randomise the order of the interviews 50 times. For each permutation of interviews, we calculated the vocabulary size at ten equally-spaced measurement points, called TEXT CHUNKS (due to the varying lengths of the interviews, we used 100 TEXT CHUNKS for dialect and 200 for the standard language). For each TEXT CHUNK, we applied the Wilcoxon test to evaluate whether vocabulary sizes diverged from the mean. We also added outer polygons to the permutation-based vocabulary sizes to show changes in vocabulary use as a function of (by-speaker randomised) interview length.

Analysis and Results

The analysis and results of our investigation into lexical frequency effects in dialect usage in Swabia cover five areas: vocabulary growth across the lifespan, Swabian orientation and lexical choice, individual patterns of lexical change across the lifespan, dialect entrenchment, and contexts of dialect usage.

VOCABULARY GROWTH

Recall that our first hypothesis claims that, rather than lose dialect, speakers actually gain substantial numbers of new standard words as they encounter novel experiences over the course of their lifespan. Figure 1 depicts THE VOCABULARY GROWTH CURVES for our 20 speakers for the two time periods. Dialect vocabulary growth is pictured on the left and standard vocabulary growth on the right; VOCABULARY SIZE (in TYPES) is shown on the vertical axis and TEXT LENGTH (in TOKENS) on the horizontal axis. Red represents the speakers' vocabulary growth curve in 1982, and blue portrays their growth curve in 2017. The results of the randomisation process are displayed via a polygon that surrounds the outer boundary, encircling all of the points. The dots illustrated vocabulary sizes for the 50 permutations. The asterisks ("*") at the upper left of each plot signify that there is a significant

difference in vocabulary size at the corresponding TEXT CHUNKS according to the Wilcoxon test ($p < .05$).

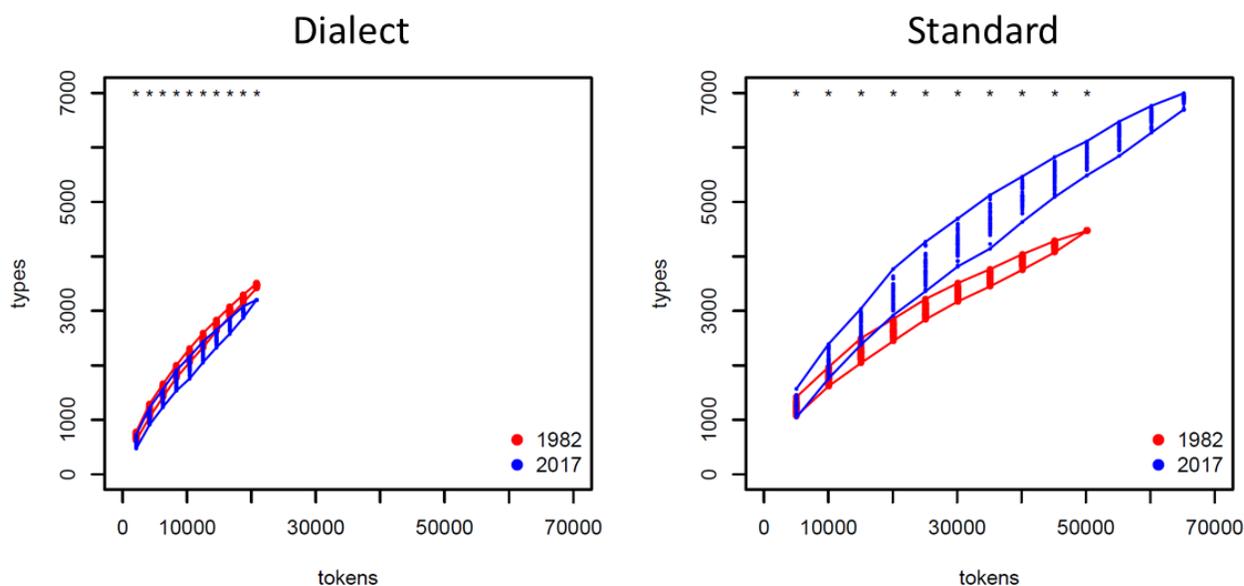


Figure 1. Vocabulary growth curves (dialect and standard) for 20 Swabian panel speakers over a 35-year timespan, using 50 permutations of interview orders, for ten equally-spaced measurement points.

From the left panel, it is evident from the overlapping red and blue polygons that there has been relatively little change in the extent to which speakers use dialect words over the 35-year timespan: speakers appear to use around hundred fewer dialect WORD TYPES in 2017 than they did in 1982. In contrast, the larger blue polygon on the right panel shows that speakers have considerably enriched their standard language vocabulary (cf. the red polygon). Their conversations made use of some 3,000 more WORD TYPES in 2017 than in 1982. These findings provide support for our hypothesis that, rather than use less dialect, in fact, speakers gain an immense amount of additional lexical knowledge that is not dialect, making it appear as if dialect has been lost. These results replicate numerous other studies that show vocabulary size increases with age (Keuleers et al. 2015; McCabe et al. 2010; Park et al. 2002). Keuleers et al. (2015:1685) claim that “age is by far the most important variable in predicting vocabulary size.... every day lived represents an opportunity for acquisition of vocabulary and that existing vocabulary is not forgotten.” As we surmised, for our Swabian speakers, the

wisdom gained through added experience is manifested in the standard language rather than in dialect.

It is interesting to note that the dialect vocabularies in 1982 and 2017 (left panel) are quite similar, which can be observed in how the polygons overlap for most of the trajectory. The two *active* vocabularies, i.e., the counts of different words used by a set of speakers in our interviews, only begin to disassociate about three quarters into the curve and are not entirely disassociated until the last interval. However, for the standard *active* vocabulary (right panel), the two trajectories disassociate much sooner, almost from the beginning, signifying that the standard language vocabularies in 1982 and 2017 are considerably more dissimilar. This leads us to the premise that the domains and contexts in which dialect is spoken have changed little over the years, whereas the domains in which the standard language is encountered are multifarious. In 1982 most of the speakers were students in their 20's at the university or starting their first jobs, with naturally quite limited life experiences. As they completed their education, travelled, moved, entered in the workforce, and made new friends, they encountered novel and diverse experiences, most of which appear to have been in context with the standard language.

Figure 2 shows similar VOCABULARY GROWTH CURVES by community, Stuttgart on the left and Schwäbisch Gmünd on the right, dialect at the top and the standard language at the bottom. As we would expect, more dialect is spoken in the semi-rural community of Schwäbisch Gmünd than in the urban centre of Stuttgart, in fact, almost double: there are close to 3,000 dialect WORD TYPES in our sample from Schwäbisch Gmünd and only 1,500 dialect WORD TYPES in our sample from Stuttgart. We also note that the *active* dialect vocabulary has declined somewhat in Stuttgart between 1982 and 2017 (by around 500 TYPES), yet remains more constant over the 35 years in Schwäbisch Gmünd (a difference of only around 100 TYPES).

The lower panels of Figure 2 establish quite clearly that speakers' *active* standard language vocabulary has expanded substantially over the 35 years. The speakers in Stuttgart have started actively using even more standard words than those in

Schwäbisch Gmünd (roughly 2,000 more WORD TYPES in Stuttgart versus 1,500 more in Gmünd), presumably partially to fill in the gap left by the small reduction in dialect usage but, more importantly, because urban life typically offers more diverse experiences than generally encountered a quieter, semi-rural town.

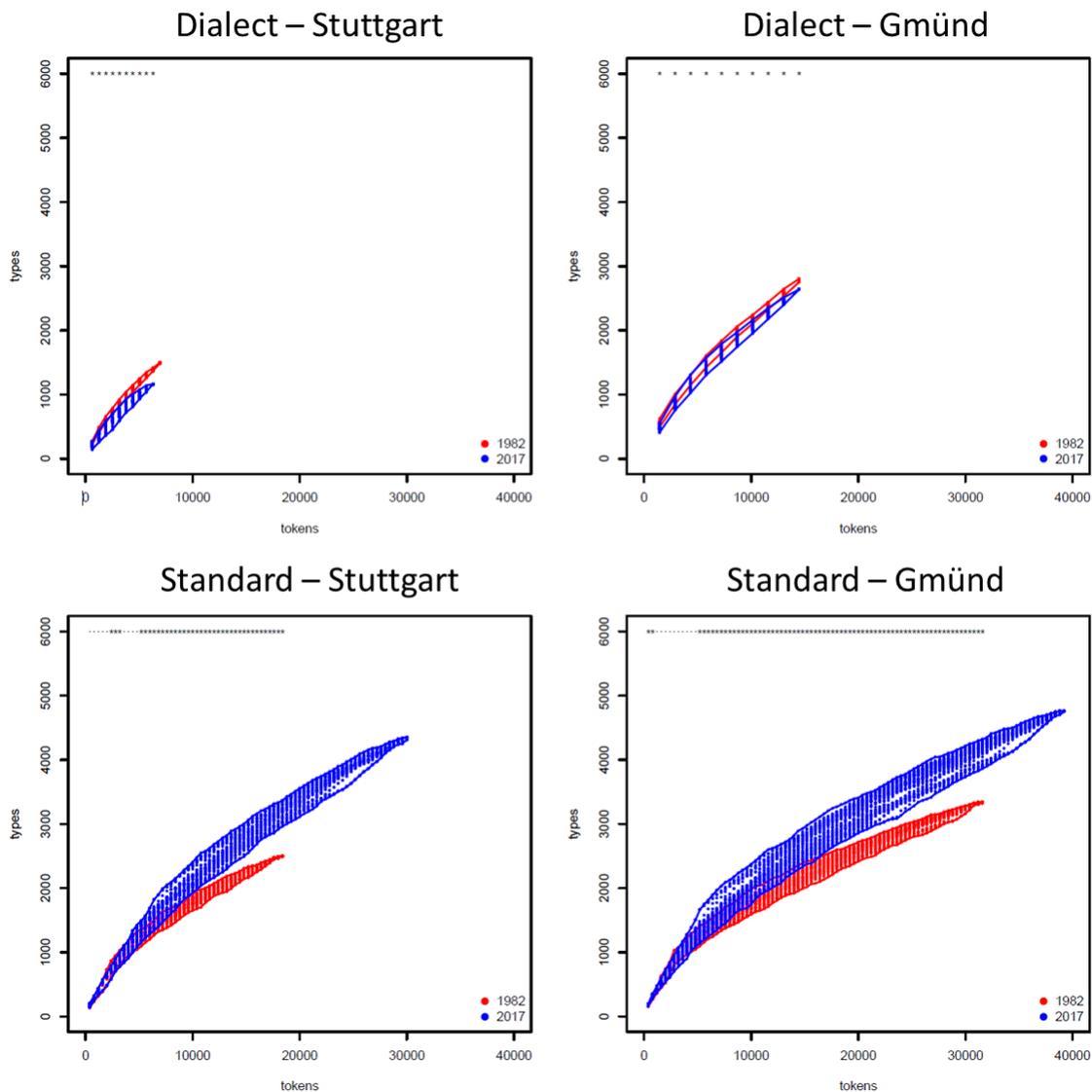


Figure 2. Vocabulary growth curves by community (Stuttgart and Schwäbisch Gmünd) for 20 Swabian panel speakers over a 35-year timespan, using 50 permutations of interview orders, for ten equally-spaced measurement points.

The right panels in Figure 2 show that the speakers from Schwäbisch Gmünd are considerably more chatty than those from Stuttgart: they produce more TOKENS (ca. 40,000 TOKENS in Gmünd versus ca. 30,000 in Stuttgart) and more WORD TYPES (ca. 4,800

TYPES in Gmünd versus ca. 4,200 in Stuttgart). Based on our ethnographic investigations of the speakers in these communities, we know that people from Schwäbisch Gmünd place a high value on their dialect, which is strengthened in the social setting via intense and frequent communication with friends and family. In the urban centre of Stuttgart, social connections are weaker and looser. Time appears to be of the essence; hence, communication is briefer and to the point. Speakers in Schwäbisch Gmünd manifest a strong orientation to Swabia, and dialect provides a conduit for bonding with the people around them, as the following citation from Angela² in 2017 shows:

ich bin ein sehr kommunikativer Mensch	I am a very communicative person
ich schwätz gern	I like chit-chatting
de Schwertkampf vom meinr Kinder	my children's sword-fighting camp
da bin i mit einige Lait befreundet	I have some friends there
mr rufet uns au mal ä	sometimes we call each other
oder wenn öiner e Sorge hat	or if one person has a concern
dann ruft er de andere ä	then he calls the others
un mä kann des dann bespreche	and then you can talk about it
i bin au gern mit dene zsamme	I like being together with them
öifach so zum schwätze	simply to chit-chat

Figure 3 presents another perspective on the lexical growth picture in Swabia by exploring the speakers' VOCABULARY GROWTH RATE by level of education. Speakers who completed their *Abitur*, the German college preparatory exam, are shown on the right and speakers without an *Abitur* on the left. From the top panels, there appears to be little change in the use of dialect based on educational attainment: both groups of speakers have retained most of their dialect words over the years. However, from the bottom panels, there is considerable growth in the active standard language vocabulary for both groups of speakers, those with and without an *Abitur*.

The types and amount of language that individuals are exposed to throughout their life vary substantially (Hart and Risley 1995). While both the highly and less highly educated groups have increased their standard vocabulary over the 35 years, we see a striking surge in 2017 for speakers with higher education (with *Abitur*). Knowledge, and specifically the accompanying vocabulary, naturally increases with education and

² All speaker names have been replaced by pseudonyms in order to protect their identities and maintain their privacy.

diversification of experience. These results can be attributed to the fact that the standard language is reinforced in school, and, indeed, many studies have confirmed the association between a loss of dialect forms and higher levels of education (Cheshire et al. 1989; Keuleers et al. 2015; Prichard and Tamminga 2012; Wieling et al. 2014).

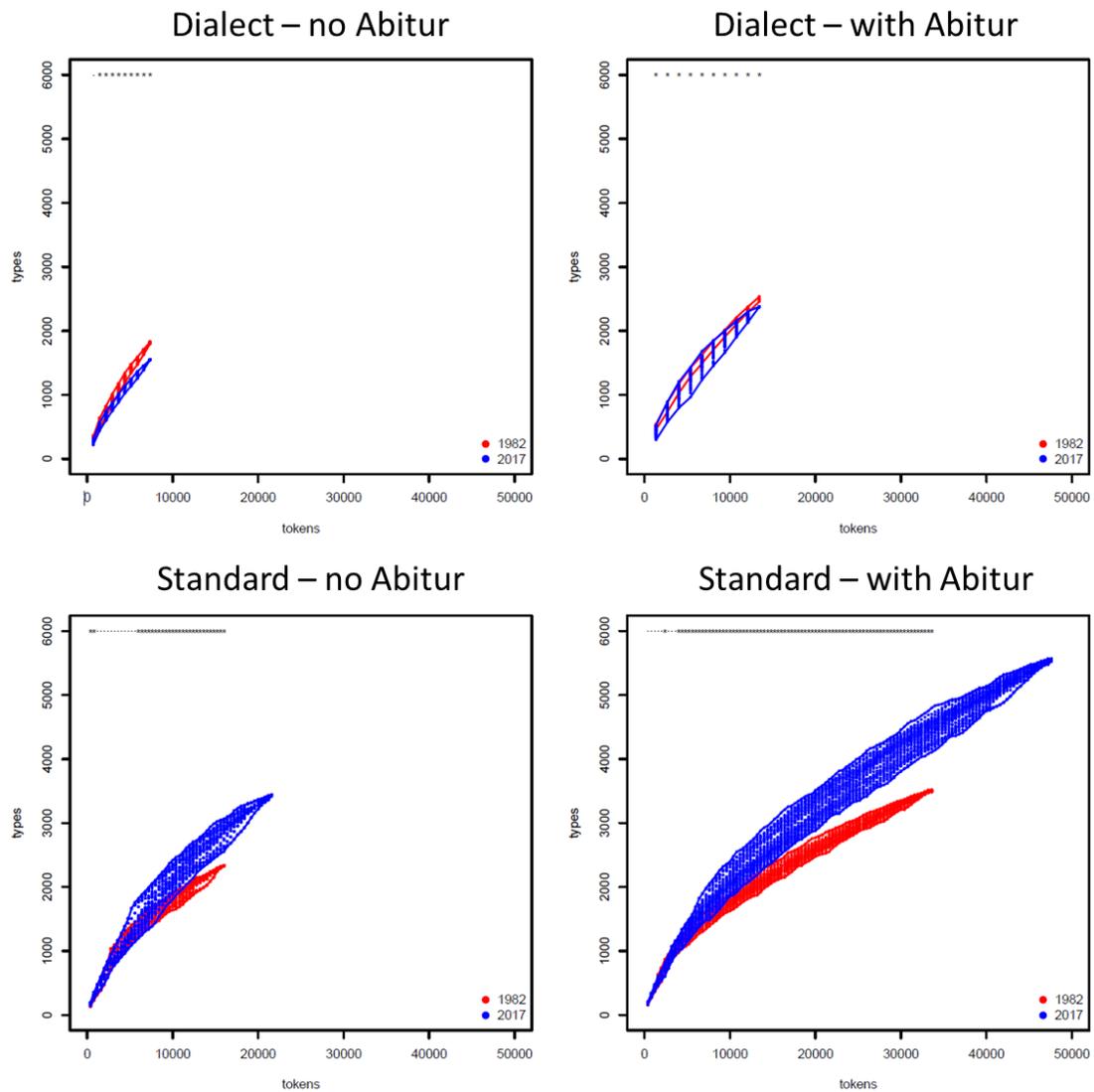


Figure 3. Vocabulary growth curves by educational level (with *Abitur*, German college preparatory exam, and without *Abitur*) for 20 Swabian panel speakers over a 35-year timespan, using 50 permutations of interview orders, for ten equally-spaced measurement points.

Increased standard language vocabulary reflects the contact and involvement that the more educated group has with the standard language. The more highly educated

speakers are also more loquacious in the standard language, presumably because they have encountered a broader range of experiences in the standard language, which in turn offers a richer vocabulary for expressing their thoughts and experiences.

ORIENTATION AND LEXICAL CHOICE

Many studies have shown that speakers' linguistic choices are influenced by their orientation or personal affinity towards the dialect or the standard language (Cheshire et al. 2008; Coupland 2007; Eckert 1989; Hoffman and Walker 2010; Horvath and Sankoff 1987; Labov 1963, 1966; Schilling-Estes 2004), which, of course, can change over the course their lifetime. Figure 4 depicts the changing prominence of Swabian orientation over the 35 years and within the two communities, exposing two critical effects that Swabian orientation has on society. The left panel brings to light the

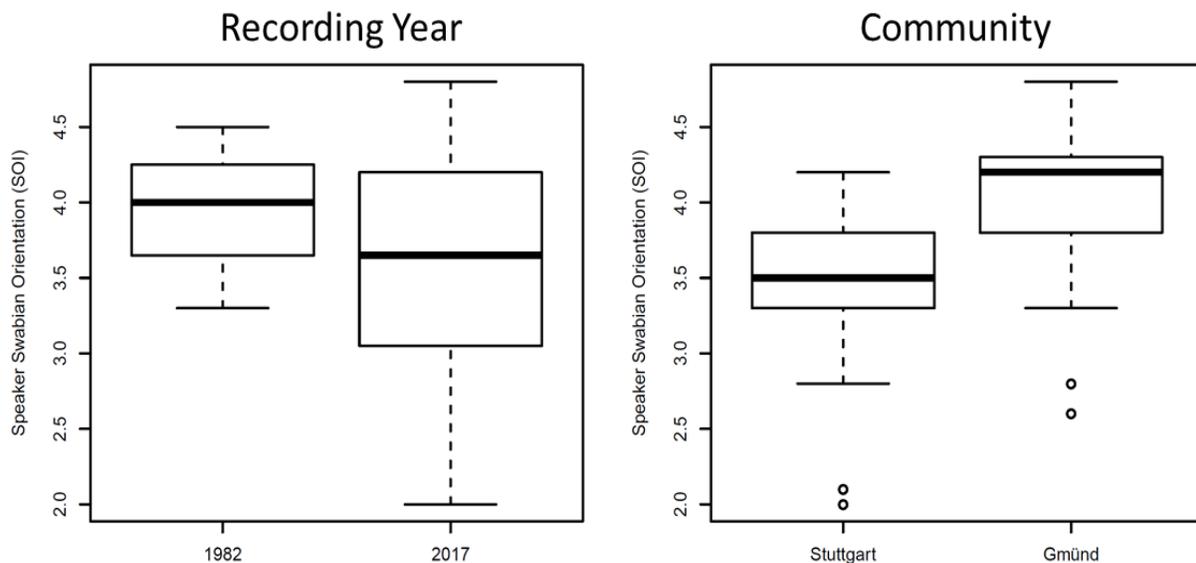


Figure 4. Swabian Orientation Index (SOI) by recording year (1982 and 2017) and community (Stuttgart and Schwäbisch Gmünd) for 20 panel speakers. SOI is calculated from speakers' answers to 16 questions posed in the interview, evaluated on a five-point scale, from 1 for the lowest to 5 for the highest Swabian orientation.

powerful role that the Swabian orientation played in 1982; however, by 2017, Swabian orientation scores have fallen considerably, now stretching out over a much broader range. The right panel tells us that Stuttgart has a noticeably lower overall Swabian orientation and than Schwäbisch Gmünd, which is not unexpected. The mid-sized,

semi-rural town of Schwäbisch Gmünd is a much smaller, tighter-knit community than the vast urban metropolis of Stuttgart. Figure 4 makes it evident that the role of Swabian identity has changed dramatically over the years, especially for Stuttgart.

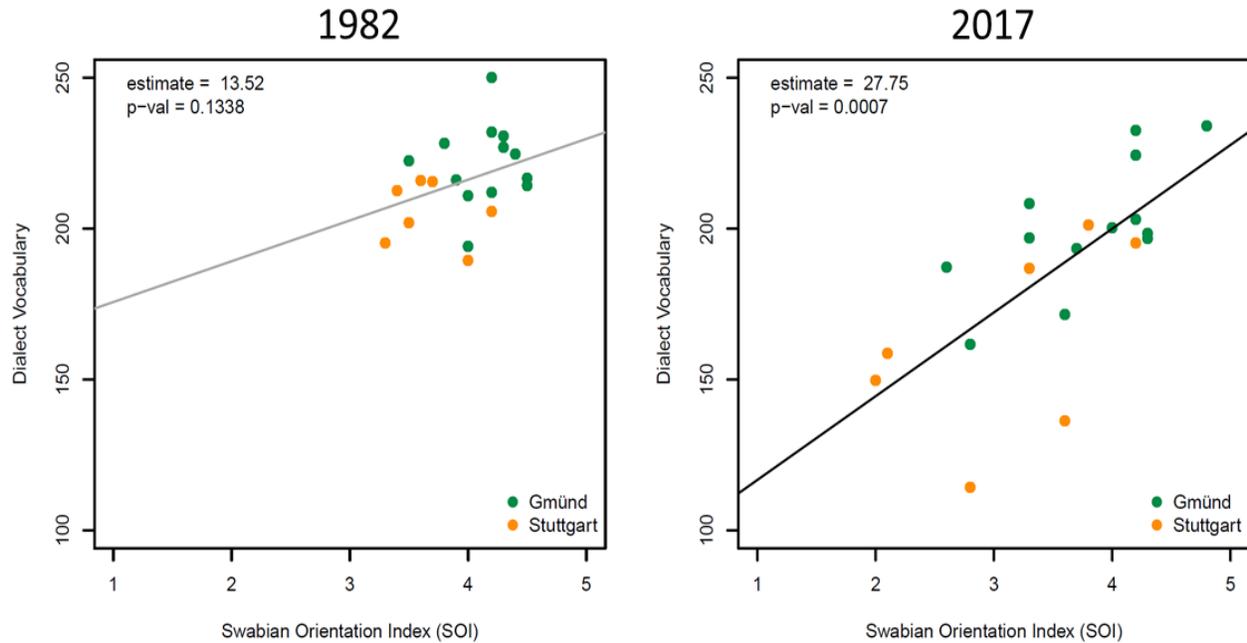


Figure 5. Dialect vocabulary size and Swabian Orientation Index (SOI) for two recording years (1982 and 2017) and two communities (Stuttgart and Schwäbisch Gmünd).

We now turn to the effect that Swabian orientation has on our individual panel speakers and their propensity to use dialect or standard vocabulary. Figure 5 plots active dialect vocabulary size (at the fourth TEXT CHUNK, about 20 minutes into the interview) and Swabian orientation for the 20 speakers, 1982 on the left and 2017 on the right. The Stuttgart speakers are denoted by orange dots and the Schwäbisch Gmünd speakers by green dots. Our first observation is the tight clustering of speakers in the upper right corner in 1982 (left panel) versus the more dispersed placement of speakers in 2017 (right panel). These speakers' similar patterns of dialect usage imply that Stuttgart and Schwäbisch Gmünd were more homogeneous in 1982 than they have become in 2017. By 2017, for many speakers, Swabian orientation has declined concomitantly with dialect vocabulary (demonstrated on the right panel by the dots spreading down and to the left). Still, we see a number of speakers, particularly from

Schwäbisch Gmünd, who have retained their high Swabian orientation and dialect vocabulary (illustrated by the clustering of green dots in the upper right). The trend is clear: the higher the Swabian orientation score, the larger the active dialect vocabulary; and conversely, the lower the speakers' orientation, the smaller the active dialect vocabulary. These findings are confirmed by a linear regression model that shows orientation not to be a significant predictor in 1982 ($\hat{\beta} = 13.285$, $p = 0.1409$), whereas it has become highly significant in 2017 ($\hat{\beta} = 27.82$, $p = 0.0007$). Conversely, we find orientation has no effect on the size of the standard vocabulary in 1982 ($\hat{\beta} = -9.802$, $p = 0.768$) and only a marginal effect in 2017 ($\hat{\beta} = -49.56$, $p = 0.04$) (graphs for standard language are not shown).

Figure 5 corroborates our finding from Figure 1, that is, while some speakers use less dialect today, other speakers use more, and this is principally driven by Swabian orientation. This leads us to the question: who are the speakers who have changed their vocabulary the most, and what are the reasons behind this change? A look into speakers' individual patterns of change across their lifespans can provide some insight.

INDIVIDUAL PATTERNS OF CHANGE

Individual patterns of linguistic change have been shown to complement and enhance insights gained from overall community change (G. Sankoff 2006; Wagner and Buchstaller 2017). Figure 6 takes a deeper dive into lifespan change by depicting individual speakers' vocabulary change from 1982 to 2017 (Figure 8 in the appendix provides the individual vocabulary growth curves for each of the 20 speakers). We used generalised additive mixed models (GAMMs) (the *mgcv* package for R, version 1.8-27) to visualise the differences in the change in active vocabulary use for the individual speakers. The left panel in Figure 6 depicts speakers' dialect vocabulary change from 1982 to 2017, and the right panel portrays speakers' standard vocabulary change over the same period. Speaker age³ in 2017 is shown on the vertical axis and speaker

³ Because there is large gap in age between the 50-60-year-olds and the over-80-year-olds in our corpus, we have left the four octogenarians out of this particular analysis so as not to skew the results.

orientation in 2017 on the horizontal axis. The contour lines delineate vocabulary change between 1982 and 2017, connecting points with the same predicted values, with the zero-contour line demarcating no change. In this colour-coded plot, higher values are shown in darker shades of yellow and smaller values in deeper shades of blue.

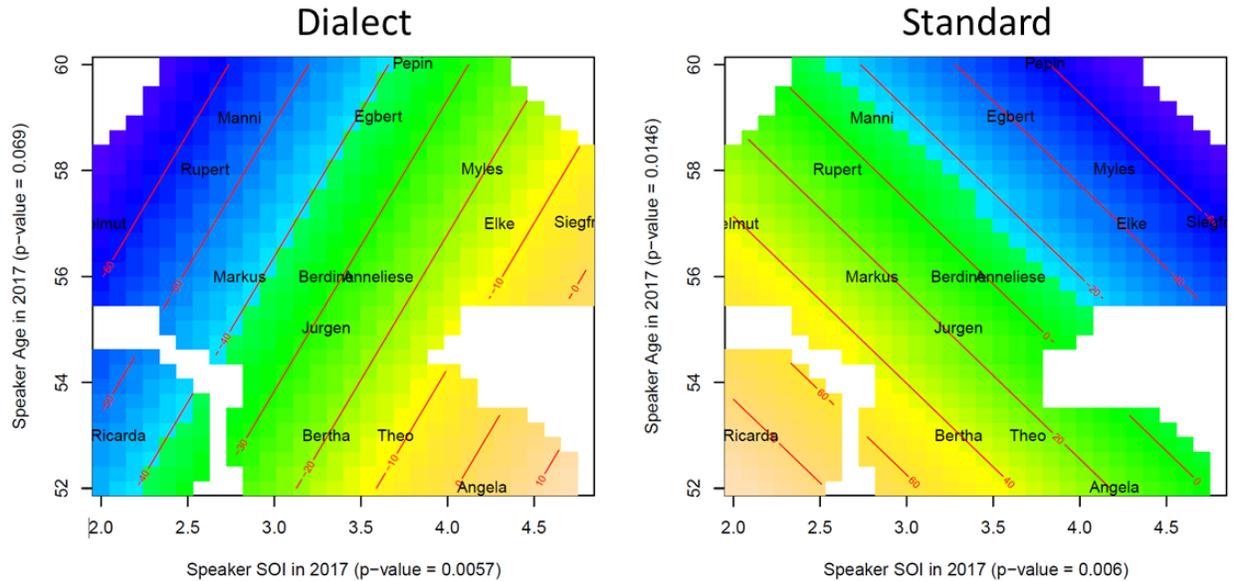


Figure 6. Dialect and standard language vocabulary change between 1982 and 2017 as a function of speaker age and Swabian Orientation Index (SOI) in 2017. Contour lines connect points with the same predicted values, signifying vocabulary change: higher values are shown in darker shades of yellow, lower values in deeper shades of blue, with middle values in shades of green. Note that the contour lines in the left plot are 10 words apart, while those in the right plot are 20 words apart; thus, the effects for the standard language are much larger.

In the left graph, illustrating speakers' dialect vocabulary change, the zero-contour line can be found in the lower right, visually establishing that there is only one speaker, Angela, who uses more dialect in 2017 than she did in 1982. (More yellow colours indicate a larger active vocabulary in 2017.) Siegfried is on the cusp, and Elke and Theo are in the yellow zone, signalling that these three speakers are continuing to use a similar amount of dialect in 2017 as they did in 1982. At the far left of the plot in the blue zone are Helmut, Rupert, and Manni, who have changed the most over the years and are now using the least dialect vocabulary. In stark contrast to the composite diagram in Figure 1, this individual view shows that active Swabian vocabulary richness has diminished over the 35-year timespan for some speakers and increased or

largely stayed the same for others, unmistakably establishing the high correlation that speakers' individual Swabian orientation has on their vocabulary. Our hypothesis is confirmed through a GAMM analysis, which shows Swabian orientation to be a highly significant (linear) predictor ($\hat{\beta} = 23.37$, $p = 0.006$). Age, however, turns out to be a marginal (linear) predictor of active dialect use, the effect of which is unreliable ($\hat{\beta} = -4.59$, $p = 0.069$).

The right panel in Figure 6, displaying the individual view of standard vocabulary change, indicates the inverse effect for Swabian orientation. (Note that because the x and y-axes have not changed, the speakers are in the same position on both graphs.) The zero-contour line, showing no change in active vocabulary for the standard language, is in the middle of the chart in the green zone. Consistent with what we reported above, the majority of speakers have gained active standard vocabulary over the years, yet there are some speakers (in particular, Pepin and Siegfried in the upper right of the graph) for whom a small decrement in active standard vocabulary is visible. The results of our GAMM regression model confirm that both orientation ($\hat{\beta} = -42.61$, $p = 0.0063$) and age ($\hat{\beta} = -11.99$, $p = 0.0149$) are significant (linear) predictors of speakers' standard vocabulary gain. As Swabian orientation scores decrease, speakers' standard vocabulary increases; as people age, their standard vocabulary decreases. Interestingly, this vocabulary decrease with age appears to be characteristic only for the use of the standard language and not for the use of dialect.

The colours depicting dialect change in Figure 6 (left panel) visually reveal the three classic patterns of individual change as identified by Sankoff (2006). The blue zone denotes LIFESPAN CHANGE, that is, those speakers moving in the direction of the overall community change by using less dialect and more standard; the green zone marks SPEAKER STABILITY, those individuals resisting change and continuing to use a similar amount of dialect across the years; and, the yellow zone portrays RETROGRADE CHANGE, speakers moving in the opposite direction of the general community change and using more dialect today than they did in 1982.

These results underscore the criticality of incorporating individual lifespan analyses into general trend studies to assist the researcher in teasing apart important influences that are otherwise hidden in community-wide averages. Concerning lexical richness, our findings establish that vocabulary change originates with the addition of new standard words gained through ongoing and novel experiences rather than in the “loss” of well-established dialect words.

Pseudonym	Community	2017				Vocabulary Change		
		Age	Sex	Abi	SOI	Dialect	Standard	Net
Manni	Stuttgart	59	M	Yes	2.8	-101	33	-69
Markus	Gmünd	56	M	Yes	2.8	-65	44	-21
Egbert	Stuttgart	59	M	Yes	3.6	-53	-82	-135
Annelise	Gmünd	56	W	Yes	3.6	-51	18	-33
Helmut	Stuttgart	57	M	Yes	2.0	-46	124	78
Ricarda	Stuttgart	53	W	Yes	2.1	-43	71	28
Louise	Gmünd	88	W	No	4.0	-30	-150	-180
Bertha	Stuttgart	53	W	No	3.3	-29	48	19
Rachael	Gmünd	83	W	No	4.3	-26	33	7
Herbert	Gmünd	86	M	No	4.2	-26	58	32
Rupert	Gmünd	58	M	Yes	2.6	-24	-38	-62
Jurgen	Gmünd	55	M	Yes	3.3	-20	45	24
Berdine	Gmünd	56	W	Yes	3.3	-19	-42	-62
Elke	Gmünd	57	W	No	4.3	-15	-82	-97
Pepin	Stuttgart	60	M	Yes	3.8	-11	-42	-53
Myles	Gmünd	58	M	Yes	4.2	-11	-33	-44
Ema	Stuttgart	83	W	No	4.2	-10	-38	-48
Theo	Gmünd	53	M	Yes	3.7	-1	1	0
Siegfried	Gmünd	57	M	Yes	4.8	2	-39	-37
Angela	Gmünd	52	W	Yes	4.2	16	62	78

Lifespan Change

Speaker Stability

Retrograde Change

Table 1. Change in speaker vocabulary size across the years (1982 versus 2017), indicating three types of dialect change across the lifespan (sorted by change in dialect vocabulary size).

Table 1 presents our panel speakers based on their degree of dialect change, demonstrating Sankoff’s (2006) three types of individual change. We can glean a few trends from this table. First, Manni and Markus, at the top of the table, use the least dialect vocabulary in 2017 and have gained a typical amount of standard vocabulary. Helmut uses less dialect and has gained the most standard words over his peers. All three of these speakers are businessmen in their late fifties, actively participating in the linguistic market (Bourdieu 1977; Eckert 1997; D. Sankoff and Laberge 1978; Wagner 2012) and frequently interacting with speakers from other dialect areas: Manni works as a consultant at the Stuttgart airport, Markus travels to Munich each week, and Helmut

is a radio moderator. Hence, it is entirely natural that these speakers would come into contact with more diverse experiences in the standard language. In contrast, at the bottom of the table, are Angela, Siegfried and Theo, with the highest Swabian orientation scores and who have retained the majority of their dialect. There are also two speakers, Ema and Pepin, who are retired, reflecting the post-retirement trend of speakers moving back to their roots and returning to more vernacular forms as they leave the workforce (G. Sankoff 2006, 2018).

It is interesting to note that there are more Stuttgart speakers at the top of the table, signalling less use of dialect in the large urban centre than the semi-rural community of Schwäbisch Gmünd. This result is not surprising considering the enormously diverse population of Stuttgart, which is one of the cities with the highest number of “foreigners” (individuals with at least one parent who immigrated⁴) in all of Germany, almost twice as many as in Germany overall (Auer 2019).

The prominence of the urban-rural divide can also be seen when comparing speakers of similar demographics, so-called “social twins” (Nordberg and Sundgren 1998; G. Sankoff and Blondeau 2010). Egbert is a middle school teacher in Stuttgart, and Siegfried is a middle school teacher in Schwäbisch Gmünd; similarly, Ricarda is an elementary school teacher in Stuttgart, and Elke is an elementary teacher in Schwäbisch Gmünd. Both teachers from Stuttgart use less dialect than the teachers from Schwäbisch Gmünd, providing additional evidence for the dialect levelling occurring in the urban centre in contrast to the vital ongoing role that dialect retains in the Swabian countryside.⁵

However, as might be expected, not all speakers have increased their standard vocabulary usage. Speakers such as Siegfried and Elke, who have retained their high Swabian orientation over the years, continue to actively use the most dialect and the least amount of standard words. Angela, a medical doctor, living near Schwäbisch Gmünd and commuting to Stuttgart for work each day, is a stark advocate for Swabian,

⁴Statistisches Amt, Landeshauptstadt Stuttgart, <https://statistik.stuttgart.de/statistiken/tabellen/7392/jb7392.php>

⁵Tests on gender differences between dialect and standard language use were not significant.

so much so that she exhibits retrograde movement, actually using more dialect in 2017 than she did in 1982. It is also important to note that her orientation values have changed very little (from 4.4 in 1982 to 4.2 in 2017). In 1982, when asked what she thought of the Swabian language, she provocatively exclaimed, *das beschte Daitsch wo es gib* ‘the best German that there is!’ Responding to the same question in 2017, she responded similarly, yet more thoughtfully:

Schwäbisch isch für mi kôï Daitsch
‘Swabian is for me not German’

sondern des isch mei Muttersprache
‘rather it is my mother tongue’

in so fern isch se zentral für mich
‘in that respect it is crucial for me’

Close to Angela in his sheer love for the Swabian dialect is Siegfried, who remarked in 2017:

viele Schwâabe erziehet ihre Kinder jetzt als net-Schwâabe
‘many Swabians raise their kids now as non-Swabians’

weil se willet, dass se Hochdeutsch schwätzt
‘because they want, that they speak standard German’

dâ kommet se an dr Uni besser zrecht ond was-wôis-i,
‘then they do better at the university und whatever’

dâ gheer i net dazu,
‘I don’t belong to [that group]’

i bin, wenn du so willsch, e stolze Schwâabe
‘I am, if you will, a proud Swabian’

on i find es schade, dass die Sprâäch verlore gâht
‘and I think it’s a shame, that Swabian is being lost’

DIALECT ENTRENCHMENT

Our second hypothesis regarding a change in dialect and standard language vocabulary across the lifespan concerns lexical entrenchment. Several studies have reported that high-frequency words are more resistant in bowing to the standard language (Bybee 2002; Keuleers et al. 2015; Wieling et al. 2014; Wieling, Nerbonne, and Baayen 2011). This finding led us to expect that higher-frequency dialect words would

be well entrenched in speakers' vocabularies. Testing this hypothesis on our data, however, is not straightforward, as one-hour interviews are unlikely to capture truly low-frequency words. All we may expect is differences in the extent of use of words that all belong to the higher frequency range. Specifically, if, over the lifetime, the typical dialect words of everyday life, become more entrenched and are in some sense more available for use, then we would expect that dialect words would show a higher frequency of use compared to 35 years ago when compared to standard language words.

Figure 7 visualises dialect and standard word usage by our 20 Swabian speakers over the 35-year timeframe of this study. The top panel plots word frequency (log transformed after backing off from zero by adding 1) for dialect in blue and standard language in red; the horizontal axis plots word frequency in 1982 and the vertical axis word frequency in 2017. Words are scattered roughly around the line $y = x$, with greater scatter for lower frequencies. However, due to the large number of overlapping points, the details of the trend are not readily apparent. Hence, the lower left panel of Figure 7 pulls out only the standard word frequencies (red points), bringing to light a non-linear trend (via GAMM). It is noteworthy that, in the lower left of the plot, very low-frequency words from the standard language that were used in 1982 appear to have been underused in 2017.

The lower right panel of Figure 7 presents the adjustment to the curve in the left panel that is required to obtain the function showing how frequency of use of dialect words in 2017 varies as a function of frequency of use in 1982. Here we see a small but significant effect indicating that dialect words in the lower range of the present set of (higher-frequency) words are used somewhat more often in 2017 compared to 1982. In other words, for the very high frequency words, frequency of use has remained constant across the 35-year timeframe, however, for the somewhat less frequent, but still fairly common words (recall that our samples are quite small), the dialect words exhibit greater entrenchment than the words of the standard language. This finding may also be related to the phenomenon that the age at which words are acquired may

predict lexical processing over and above frequency, with earlier acquired words having a processing advantage over later acquired words (see Baayen, Milin, and Ramscar 2016 for a critical discussion). The present results fit well with our overall hypothesis that dialect, for speakers with a positive attitude toward Swabian, is alive and robust, albeit limited with respect to the number of social contexts for which its use is appropriate.

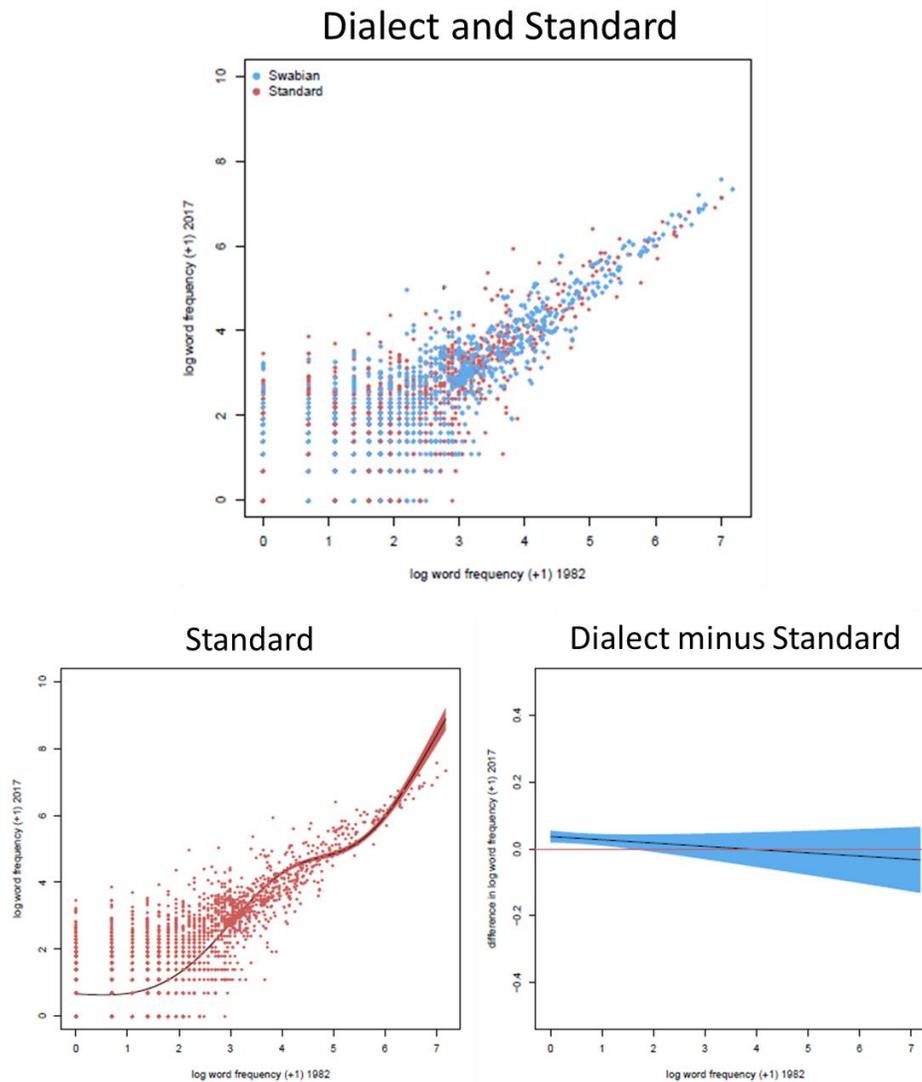


Figure 7. Lexical frequency effects between 1982 and 2017 (log transformed +1); blue dots represent dialect word frequency and red dots standard word frequency. Dialect minus Standard (lower right panel) shows the difference between dialect and standard word frequencies.

CONTEXTS OF DIALECT USAGE

Our third hypothesis proposes that speakers use more dialectal forms where context makes early experiences more relevant and fewer dialectal forms where context renders later life experiences more applicable. Our data provide some tangential evidence for this claim. We have seen that lexical diversity is greatest for the use of standard forms and, most prominently, for speakers with higher education: education broadens the mind to a wider range of topics and prepares students for a great diversity of technically further specialised roles in society.

Table 2 reflects this change by showing the variability in the numbers of TYPES and TOKENS our speakers produced. For both TOKENS and TYPES, there is a steady progression in the magnitude of the variances from dialect in 1982 to dialect in 2017 to standard German in 1982 and to standard German in 2017. This progression supports our hypothesis that experiences, and the words speakers use to communicate these experiences, diversify over the lifetime and that this diversification of experiences is most notable in domains for which the standard language is the medium of choice.

Register	Year	Tokens	Types
Dialect	1982	60,964	210
Dialect	2017	169,198	960
Standard	1982	182,198	2,701
Standard	2017	1,862,277	6,881

Table 2. Total number of active tokens (i.e., total words uttered) and types (i.e., unique words used) for dialect and standard language usage across two time periods, 1982 and 2017, for 20 Swabian panel speakers.

To further support this position, we know that the culture and lifestyles of our informants were much more similar to each other in 1982 than they have become in 2017. In 1982, the speakers were students in their mid 20's who had travelled little and continued to maintain strong, close connections with family and friends from their home town. They reflected a more 'closed' social network (Milroy and Milroy 1985) which is reinforced through greater use of the dialect. Thirty-five years later, these

speakers have scattered from northern Germany to Zürich. Most now live in more ‘open’ social networks, in which connections and ties are loose, varied, and dispersed, necessitating use of the standard language as a *lingua franca*.

Validation of the breakdown of the communities over the 35 years is supported through three composite measures. First, as previously discussed, the Swabian Orientation Index (SOI) shows a weakening, from an average of 4.0 in 1982 to 3.6 in 2017, with the greatest deterioration among the Stuttgart speakers, from 3.7 to 3.1 (see Table 3 in the Supplemental Materials). Second, a Swabian Relationship Index (SRI), which measures the strength of the relationships among the informants in the community, has also declined for all speakers, from 3.0 in 1982 to 2.3 in 2017. SRI measures the degree and nature of the interaction among the speakers in each community: from 5 for daily, intensive communication to 4 for strong, regular communication to 3 for solid friendship and occasional interaction to 2 for acquaintances who rarely interact to 1 for no interaction (see Table 4 in the Supplemental Materials). Third, a Swabian Mobility Index (SMI) measures speakers’ dispersion (number of different towns they have lived in across their lifetime and the amount of time spent in each location) and distance (numbers of kilometres between the speaker’s birthplace and each residence, weighted by the number of years in each location). On a scale from 0 for the least mobile speakers (those born, raised and never moved from their home town, and even the same house for one speaker) to 100 for the most mobile, mobility for our Swabian panel speakers has increased from 12 in 1982 to 38 in 2017, with those from Schwäbisch Gmünd showing the greatest amount of change (from SMI of 9 in 1982 to 38 in 2017). These measures demonstrate the changing nature of our two Swabian speech communities and provide evidence that speakers had many more commonalities in 1982 than they do in 2017.

It is also worth noting that a decrease in active vocabulary as used in our interviews is well supported only for the standard language. As individuals grow older, their world becomes smaller and they have fewer topics to talk about. The topics that disappear are likely to be those that become somewhat irrelevant later in life. Here,

retirement is, for many, a watershed. Conversely, although experiences for which dialect is the appropriate vehicle also diversify over the lifetime, this diversification is much more restricted.

Final Remarks

Conventional views of individual lifespan dialect change are typically seen as reflecting the attritional effect of the standard language on the native dialect. In contrast, the findings from our investigation of 20 panel speakers of Swabian confirm the possibility that at least some of the changes in word use across the lifespan reflect the increased influence of later acquired, non-dialect, lexical knowledge, rather than the “loss” of dialect as a result of attrition. Rather than “lose” dialect as they age, speakers have a broader range of options available to them through a larger vocabulary developed throughout their lifetime, which accrues to a different “register”, the standard language.

Our findings thus underscore the criticality of taking into account the dynamicity of lexical distributions in interpreting language development across the lifespan. Ramskar and colleagues (Ramskar et al. 2013, 2017; Ramskar and Baayen 2014) have recently shown how many changes in cognitive performance across the lifespan that are taken to reflect “decline” look very different once we control for the inevitable interactions that occur between lexical distributions and the nature of lifetime learning. Although we identified some changes in some of our speakers that are consistent with attrition, to a large degree, our data support the more likely scenario that many of the changes in the balance between standard and dialect speech which are observed across the lifespan reflect change in speakers’ lifestyles and growth in their knowledge of the standard language combined with further consolidation of the dialect.

References

- Auer, Peter. 2005. “Europe’s Sociolinguistic Unity, or: A Typology of European Dialect/standard Constellations.” In *Perspectives on Variation: Sociolinguistic, Historical, Comparative*, eds. Nicole Delbecque, Johan van der Auwera, and Dirk Geeraerts. Berlin: Mouton de Gruyter, 7–42.

- — —. 2007. "Mobility, Contact and Accommodation." In *The Routledge Companion to Sociolinguistics*, eds. Carmen Llamas, Louise Mullany, and Peter Stockwell. London: Routledge, 109–15.
- — —. 2018. "Dialect Change in Europe -- Leveling and Convergence." In *The Handbook of Dialectology*, eds. Charles Boberg, John Nerbonne, and Dominic Watt. Oxford: Wiley-Blackwell, 159–76.
- — —. 2019. "Dialect (Non-)Acquisition and Use by Young People of Migrant Background in Germany." *Journal of Multilingual and Multicultural Development*.
- Auer, Peter, Peter Baumann, and Christian Schwarz. 2011. "Vertical vs. Horizontal Change in the Traditional Dialects of Southwest Germany: A Quantitative Approach." *Taal en Tongval* 63(1): 13–41.
- Auer, Peter, and Helmut Spiekermann. 2011. "Demotisation of the Standard Variety or Destandardisation? The Changing Status of German in Late Modernity (with Special Reference to Southwestern Germany)." In *Standard Languages and Language Standards in a Changing Europe*, eds. Tore Kristiansen and Nikolas Coupland. Oslo: Novus Press.
- Baayen, R. Harald. 2001. *Word Frequency Distributions*. Dordrecht: Kluwer Academic Publishers.
- — —. 2008. *Analyzing Linguistic Data: A Practical Introduction to Statistics Using R (Second Edition)*. Cambridge: Cambridge University Press.
- Baayen, R. Harald, Petar Milin, and Michael Ramscar. 2016. "Frequency in Lexical Processing." *Aphasiology* 30(11): 1174–1220.
- Beaman, Karen V. 2018. "Identity and Place: The Changing Role of Swabian in Modern Germany." In *Conference on Language, Place and Periphery*, University of Copenhagen. January 18-19, 2018.
- Blake, Renée, and Meredith Josey. 2003. "The /ay/ Diphthong in a Martha's Vineyard Community: What Can We Say 40 Years after Labov?" *Language in Society* 32(4): 451–85.
- Bourdieu, Pierre. 1977. "The Economics of Linguistic Exchanges." *Social Science Information* 16(6): 645–68.
- Britain, David. 2013. "Space, Diffusion and Mobility." In *The Handbook of Language Variation and Change*, eds. J. K. Chambers and Natalie Schilling. Wiley-Blackwell.
- — —. 2016. "Sedentarism and Nomadism in the Sociolinguistics of Dialect." In

Sociolinguistics: Theoretical Debates, ed. Nikolas Coupland. Cambridge: Cambridge University Press, 217–41.

- Britain, David, and Peter Trudgill. 1999. "Migration, New-Dialect Formation and Sociolinguistic Refunctionalisation: Reallocation as an Outcome of Dialect Contact." *Transactions of the Philological Society* 97(2): 245–56.
- Bybee, Joan L. 2002. "Word Frequency and Context of Use in the Lexical Diffusion of Phonetically Conditioned Sound Change." *Language Variation and Change* 14(3): 261–90.
- Cheshire, Jenny et al. 1989. Dialect and Education: Some European Perspectives *Dialect and Education in Europe: A General Perspective*. eds. Jenny Cheshire, Viv Edwards, Henk Munstermann, and Bert Weltens. Clevedon: Multilingual Matters LTD.
- Cheshire, Jenny, Sue Fox, Paul Kerswill, and Eivind Torgersen. 2008. "Ethnicity, Friendship Network and Social Practices as the Motor of Dialect Change: Linguistic Innovation in London." *Sociolinguistica*: 1–23.
- Coupland, Nikolas. 2007. *Style: Language Variation and Identity*. Kindle Edition. Cambridge: Cambridge University Press.
- Dodsworth, Robin. 2017. "Migration and Dialect Contact." *Annual Review of Linguistics* 3: 331–46.
- Eckert, Penelope. 1989. *Jocks and Burnouts: Social Categories and Identity in the High School*. New York: Teachers College Press.
- — —. 1997. "Age as a Sociolinguistic Variable." In *The Handbook of Sociolinguistics*, ed. Florian Coulmas. United Kingdom: Blackwell Publishing, 151–67.
- Giles, Howard, Daniel J. Taylor, and Richard Yvon Bourhis. 1973. "Towards a Theory of Interpersonal Accommodation through Language: Some Canadian Data." *Language in Society* 2(2): 177–92.
- Hart, B., and T. Risley. 1995. *Meaningful Differences in the Everyday Experience of Young American Children*. Baltimore: Paul H. Brookes Publishing.
- Hoffman, Michol F., and James A. Walker. 2010. "Ethnolects and the City: Ethnic Orientation and Linguistic Variation in Toronto English." *Language Variation and Change* 22: 37–67.
- Horvath, Barbara M., and David Sankoff. 1987. "Delimiting the Sydney Speech Community." *Language in Society* 16(2): 179–204.

- Kehrein, Roland. 2012. *Regionalsprachliche Spektren Im Raum: Zur Linguistischen Struktur Der Vertikale. Zeitschrift Für Rezensionen Zur Germanistischen Sprachwissenschaft. Beihefte 152.* Stuttgart: Franz Steiner Verlag.
<https://www.degruyter.com/view/j/zrs.2015.7.issue-1-2/zrs-2015-0012/zrs-2015-0012.xml>.
- Keuleers, Emmanuel, Michael Stevens, Pawel Mandera, and Marc Brysbaert. 2015. "Word Knowledge in the Crowd: Measuring Vocabulary Size and Word Prevalence in a Massive Online Experiment." *The Quarterly Journal of Experimental Psychology* 68(8): 1665–92.
- Labov, William. 1963. "The Social Motivation of a Sound Change." *Word* 19(3): 273–309.
- — —. 1964. "Stages in the Acquisition of Standard English." In *Social Dialects and Language Learning*, ed. Roger W. Shuy. Champaign, IL: National Council of Teachers of English, 77–104.
- — —. 1966. *The Social Stratification of English in New York City*. 2nd ed. Cambridge: Cambridge University Press.
- — —. 1984. "Field Methods of the Project Linguistic Change and Variation." In *Language in Use: Readings in Sociolinguistics*, eds. John Baugh and Joel Scherzer. Englewood Cliffs NJ: Prentice Hall, 28–53.
- McCabe, David P. et al. 2010. "The Relationship between Working Memory Capacity and Executive Functioning: Evidence for a Common Executive Attention Construct." *Neuropsychology* 24(2): 222–43.
- Milroy, James, and Lesley Milroy. 1985. "Linguistic Change, Social Network and Speaker Innovation." *Journal of Linguistics* 21(2): 339–84.
- Nordberg, Bengt, and Eva Sundgren. 1998. *On Observing Real-Time Language Change: A Swedish Case Study*. SoLiD nr 10 (=FUMS Rapport nr 190). Uppsala University, Uppsala.
- Park, Denise C. et al. 2002. "Models of Visuospatial and Verbal Memory across the Adult Life Span." *Psychology and Aging* 17(2): 299–320.
- Pedersen, Inge Lise. 2005. "Processes of Standardisation in Scandinavia." *Dialect Change: Convergence and Divergence in European Languages*: 171–95.
- Prichard, Hilary, and Meredith Tamminga. 2012. "The Impact of Higher Education on Philadelphia Vowels." *University of Pennsylvania Working Papers in Linguistics* 18(2).

- Ramscar, Michael, and R. Harald Baayen. 2014. "The Myth of Cognitive Decline: Why Our Minds Improve as We Age." *New Scientist* 221(2961): 28–29.
- Ramscar, Michael, Peter Hendrix, Bradley Love, and R. Harald Baayen. 2013. "Learning Is Not Decline: The Mental Lexicon as a Window into Cognition across the Lifespan." *The Mental Lexicon* 8(3): 450–81.
- Ramscar, Michael, Ching Chu Sun, Peter Hendrix, and R. Harald Baayen. 2017. "The Mismeasurement of Mind: Life-Span Changes in Paired-Associate-Learning Scores Reflect the 'Cost' of Learning, Not Cognitive Decline." *Psychological Science* 28(8): 1171–79.
- Sankoff, David, and Suzanne Laberge. 1978. "The Linguistic Market and the Statistical Explanation of Variability." In *Linguistic Variation: Models and Methods*, ed. David Sankoff. New York: Academic Press, 239–50.
- Sankoff, Gillian. 2006. "Age: Apparent Time and Real Time." *Encyclopedia of Language and Linguistics*. (1): 110–16.
- — —. 2018. "Language Change Across the Lifespan." *Annual Review of Linguistics* 4: 297–316.
- Sankoff, Gillian, and H el ene Blondeau. 2010. "Instability of the [R] ~ [r] Alternation in Montreal French: The Conditioning of a Sound Change in Progress." *Variation*: 1–25.
- Schilling-Estes, Natalie. 2004. "Constructing Ethnicity in Interaction." *Journal of Sociolinguistics* 8(2): 163–95.
- Schmidt, J urgen Erich. 2011. "Formation of and Change in Regiolects and (Regional) Dialects in German." *Taal en Tongval* 63(1): 143–73.
- Streck, Tobias, and Peter Auer. 2012. "Das Raumbildene Signal in Der Spontansprache: Dialektometrische Untersuchungen Zum Allemannischen in Deutschland." *Zeitschrift f ur Dialektologie und Linguistik* 79(2): 149–88.
- Trudgill, Peter. 1986. *Dialects in Contact*. Oxford: Blackwell Publishing.
- — —. 1992. "Dialect Contact, Dialectology and Sociolinguistics." In *Sociolinguistics Today: International Perspectives*, eds. Kingsley Bolton and Helen Kwok. London: Routledge, 71–79.
- Wagner, Suzanne Evans. 2012. "Age Grading in Sociolinguistic Theory." *Linguistics and Language Compass* 6(6): 371–82.

- Wagner, Suzanne Evans, and Isabelle Buchstaller. 2017. *Panel Studies of Variation and Change*. eds. Suzanne Evans Wagner and Isabelle Buchstaller. New York: Routledge.
- Wieling, Martijn, Simonetta Montemagni, John Nerbonne, and R. Harald Baayen. 2014. "Lexical Differences between Tuscan Dialects and Standard Italian: Accounting for Geographic and Socio-Demographic Variation Using Generalized Additive Mixed Modeling." *Language* 90(3): 669–92.
- Wieling, Martijn, John Nerbonne, and R. Harald Baayen. 2011. "Quantitative Social Dialectology: Explaining Linguistic Variation Geographically and Socially." *PLoS ONE* 6(9): 1–14.
- Wittenburg, Peter et al. 2006. "ELAN: A Professional Framework for Multimodality Research." *Proceedings of the Fifth International Conference on Language Resources and Evaluation (LREC)*: 1556–59.