

Extraverted innovators and conscientious laggards? Investigating effects of personality traits on language change

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Abstract

Although personality-related factors play a crucial role in sociolinguistics as conceivable sources of language variation and change, there is insufficient quantitative evidence on such relationships. Using a large and balanced sample ($n = 1000$), this study investigated effects of personality traits on the use of a Swiss German plural marker in its early stages of diffusion. Besides age and region, conscientiousness and extraversion emerged as the most important predictors: less conscientious and, to a certain extent, more extraverted speakers were more likely to contribute to the diffusion of the morphological innovations under investigation. Based on our results, we argue that less conscientious speakers might monitor their own speech and that of others less closely, thus adopting innovations earlier, whereas extraverted speakers may act as successful brokers in transmitting innovations from one social group to another.

Keywords: sociogrammatical variation and change; personality; Swiss German; leaders of language change

Introduction

Questions related to innovation diffusion, or rather to *who* contributes in which way to the diffusion of innovations, have been a central focus of debate since the beginnings of sociolinguistic examination of language change. While personality traits have sparked discussions about the characteristics of leaders of language change, research on their potential impact has been rather limited. This study seeks to bridge this gap by investigating effects of conscientiousness, extraversion, and openness on grammatical change in relation to a Swiss German plural marker in its early stages of diffusion. The paper begins with an overview of the general role of personality in innovation diffusion before turning to introduce *-ene* plurals in Swiss German, the particular phenomenon on which personality influences are tested. The participants, materials, and procedures of the current study are detailed in the methods section. Subsequently, the diffusion of *-ene* plurals is outlined, and findings based on mixed-effects modeling are presented. Finally, the identified effects are discussed with the main focus on the interrelations between personality and language change.

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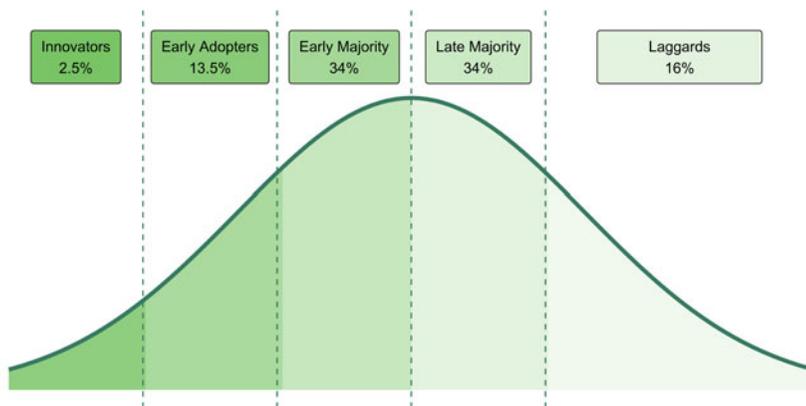
Adopter categorisation according to Rogers (2017)

Figure 1. Innovation diffusion curve with adopter categorization according to Rogers (2017:247).

Innovation diffusion and the role of personality

In order for an innovation to spread, it needs to be adopted and passed on among the members of a community. Rogers' (2017) theory of innovation diffusion, developed in the early 1960s, describes the process of how and why an idea or a product diffuses through a population, starting with a small number of venturesome innovators and diffusing through the subsequent adopter groups, as visualized in Figure 1.

This concept was soon taken up by other disciplines and gained popularity in sociolinguistics in particular, with the most intriguing questions revolving around who the innovators are (e.g., Labov, 2001:190-192, 323-411; Tamminga, 2021). Besides traditional Labovian macrocategories (e.g., age, gender, region, social class), social networks, affective factors, and mobility, speaker personality has gained increasing attention in such debates.

Before presenting specific studies, it is crucial to understand how personality is approached in this paper. One of the most widely accepted models of personality is the "Big Five," comprising the following independent and relatively stable traits (Goldberg, 1993; McCrae & Costa, 1987; McCrae & John, 1992):

- 1) *Conscientiousness*, associated with a person's reliability, dutifulness, thoroughness, and diligence
- 2) *Extraversion*, measuring assertiveness, gregariousness, sociability, and expressiveness
- 3) *Openness* (or 'openness to experience'), capturing an individual's wide range of interests, curiosity, intellectuality, and unconventional values
- 4) *Agreeableness*, encompassing trustworthiness, kindness, and politeness
- 5) *Neuroticism*, referring to an individual's emotional stability

Over the past decades, psychological research has demonstrated that language can be indicative of these dispositions (see Azucar, Marengo, & Settanni, 2018; Caplan,

Adams, & Boyd, 2020; Tausczik & Pennebaker, 2010). From classical, correlational studies (e.g., Cohen, Minor, Baillie, & Dahir, 2008; Hirsh & Peterson, 2009; Pennebaker & Graybeal, 2001; Pennebaker & King, 1999) to innovative methods with social media data and natural language processing (e.g., Boyd & Pennebaker, 2017; Park, Schwartz, Eichstaedt, Kern, Kosinski, Stillwell, Ungar, & Seligman, 2014), interrelations of language and personality have been tested in a multitude of studies. A noteworthy study in the German context is Andresen (2015), who found positive correlations between extraversion and the use of certain discourse particles and interjections, and that introverted speakers used more vague expressions compared to their extraverted peers.

Regarding innovation diffusion, Rogers (2017:257-258) suggested that adopter groups can be distinguished based on their personality, with earlier adopters, for example, showing greater empathy and having a more open belief system compared to later adopters. Although intuitively it is perfectly reasonable that such mechanisms may apply to linguistic innovativeness (e.g., that curiosity and creativeness lead to a more progressive language use) and leaders of language change have been characterized as a small group with distinctive personality characteristics (e.g., Labov, 2001:382-411; Labov, 2018), empirical findings are limited. A rare example comes from Stuart-Smith and Timmins (2010), who investigated the effects of social identity and personality on sound change in Glaswegian. Their participants were assigned to Rogers' adopter categories (see Figure 1) based on social relations, nonlinguistic innovativeness behavior, and personality traits, and their findings suggested that adopter categories corresponded to the investigated sound changes. A similar question was addressed in Cheshire, Fox, Kerswill, and Torgersen (2008). With reference to Wenger (1998:109) and Eckert (2000:199-228), linguistic innovativeness was discussed in relation to brokering and personality. Based on their findings, Cheshire et al. (2008:23) concluded that personality factors can be decisive in the capacity to act as successful brokers and to exert social influence in the transmission of new ideas.

Quantitative insights into the relation between personality and language change mainly come from studies on speech accommodation. Early research by Welkowitz and Feldstein (1969, 1972) indicated that speakers who perceived themselves as similar in terms of attitudes and personality were more likely to influence each other's speech patterns and timing (e.g., they converged in vocal intensity and pause duration). Dimov, Shira, and Johnson (2012) found that the trait of empowerment, defined as the capacity to wield control, was negatively associated with compensation for altered auditory feedback. However, their findings were based on a small and unbalanced sample (forty-nine male students). In a larger sample ($n = 93$), Yu, Abrego-Collier, and Sonderegger (2013) experimentally tested how personality traits affect phonetic imitation by randomly assigning participants to four conditions with varying narrator characteristics and story outcomes, and assessed shifts in the participants' VOT according to the condition. Although the results suggested high variability in phonetic imitation both across contexts and participants, they found openness to be associated with a shift toward the narrator, while conscientiousness tended to be associated with shifting away from the narrator, though the latter effect was not statistically significant across different model parametrizations. Denis (2011) reported a

positive relation between gregariousness (measured by the number of references to friends in an interview) and the diffusion of morphosyntactic innovations. This study also indirectly revealed the close intertwining of personality and social networks: Denis' (2011:65) metric of "apparent gregariousness," which is inherently related to extraversion (see above), was taken as an indicator of social networks, based on the assumption that more gregarious and sociable speakers can rely on denser and more multiplex networks. With the aim of investigating how "factors related to commonly-proposed sociolinguistic leadership traits" may predict linguistic innovativeness, Tamminga (2021:271) tested effects of extraversion on a set of covarying reversing vowel changes in a sample of fifty-six young women from Philadelphia. Contrary to her expectations, extraversion did not correlate with the sound changes under scrutiny, which is why Tamminga (2021:283-285) attested that extraversion might not be a primary predictor of language change, at best playing a supporting role instead.

The linguistic variable: -ene plurals in Swiss German

Given the aim to gain a better understanding of how personality relates to linguistic innovativeness, we needed to investigate a phenomenon in its early stages of diffusion. Whereas the very incipient stage can hardly be detected empirically, the focus in this paper is on a change that can be classified as still "new and vigorous" (Labov, 2001:132): the diffusion of *-ene* plurals in Swiss German.

Before turning to the particular phenomenon, it is important to consider the sociolinguistic situation in German-speaking Switzerland. The Swiss German context differs not only from that of other languages such as English or Spanish, but also from other varieties of German in two main ways. First, Swiss German speakers are primarily socialized in the nonstandard variety, whereas the codified standard is predominantly learned in school or from the media. Hence, all speakers are competent users of their local dialect. Secondly, German-speaking Switzerland displays a special form of diglossia, where dialects are not stigmatized but are prestigiously valued and may serve as iconic markers of local identity (e.g., Berthele, 2004; Steiner, Jeszenszky, & Leemann, 2022; Studler, 2013, 2017). These two aspects distinguish dialect change from other contexts and thus are important to bear in mind when interpreting findings on Swiss German innovation diffusion.

With regard to the plural system, native Swiss German nouns can be divided into five inflection classes: zero plurals, umlaut plurals, and three additive plurals with the suffixes *-er*, *-e*, and *-ene* (e.g., Marti, 1985:86-90; Weber, 1948:111-119). This classification is largely representative of all dialects with a crucial exception in this paper's context related to feminine zero plurals: while zero plurals such as *Tanne-ø* 'firs-F.PL' prevail in northern, central, and eastern regions, plurals in southwestern regions are mostly formed with a word-final vowel change (e.g., *Tanne - Tanni*), thus, they are morphologically differentiated in these dialects (see SDS III, 1975, maps 183/186).

In recent decades, several changes have been observed regarding enhanced number opposition, one of which is the diffusion of *-ene* plurals (see Landolt, 2010:105-106 for examples). This plural suffix was documented in the historical atlas of German-speaking

Switzerland around the 1950s (*Sprachatlas der deutschen Schweiz*, henceforth SDS, 1962–2003) as the traditional marker for disyllabic feminine nouns ending in *-i* (e.g., *Chuchi - Chuchene* ‘kitchen - kitchens’; SDS III, 1975, map 187). Along the lines of enhanced number opposition, it has been speculated that the *-ene* suffix is currently diffusing rapidly to a series of other nouns (e.g., Graf, 2015; Landolt, 2010), as shown in (1)–(3).¹

- (1) Disyllabic feminine nouns ending in *-e* (main type):

Sohle – *Sohlene*
 sole:F.SG – soles-F.PL

- (2) Apocopied (monosyllabic) feminine nouns:

Brügg – *Bruggene*
 bridge:F.SG – bridges-F.PL

- (3) Neuter nouns:

Thema – *Themene*
 topic:N.SG – topics-N.PL

The diffusion of *-ene* plurals has been described as the most profound current change in Alemannic inflection (Nübling, 2008:318). Klein and Kopf (2019) presented an interesting adaptation of a model by Köpcke (1988, 1993), according to which the potential for *-ene* plurals to spread can be explained by their high saliency (e.g., compared to zero plurals), their frequent applicability, and their reservation for plural marking (i.e., the *-ene* suffix does not appear in the singular as a contrast category). Further, Klein and Kopf (2019:35) discussed its importance for feminine plurals because they cannot rely on syntagmatic support from the article (in German, *die*-F.SG and *die*-F/M/N/.PL are formally identical). Whether the *-ene* plural is a standard-convergent or divergent innovation is a matter of debate. Landolt (2010:63ff.), for example, argued for an interpretation of *-ene* plurals as a loan formation from Standard German due to formal analogies. In this view, an application of the *-ene* suffix, as in *Rosene* ‘roses,’ is seen as formally identical to the standard plural system, in which disyllabic feminine nouns are generally suffixed with *-n* (e.g., *Rosen*). On the other hand, the phenomenon can be historically traced as an Alemannic innovation (see Kopf, 2014; Szadrowsky, 1933) and supporters of intradialectal theories such as Christen (1998:58, 63) have argued that the diffusion of *-ene* plurals exemplifies an extension of an existing dialectal principle, resulting in supraregional dialect convergence and standard divergence.

Despite the lively debates, evidence on the diffusion of *-ene* plurals is mostly anecdotal (e.g., Christen, 1997, 1998; Graf, 2015; Landolt, 2010; Rowley, 1997). A rare empirical exception comes from a study conducted in two villages by Catillaz (1982), who reported instances of innovative *-ene* plurals in disyllabic feminine nouns, which seemed to be determined mainly by place and age. While the age trend was in the expected direction of an apparent-time change, the effect of place was rather surprising: speakers from the smaller, more rural village seemed to be more innovative than those from the bigger village in the vicinity of the urban area of Bern. Catillaz offered an interesting explanation for this finding, concluding that speakers living closer to Bern might view the *-ene* suffix as a typical Bernese marker, and hence refrain from using it in order to distance themselves linguistically from their

urban neighbors. In a more recent study on loanwords and abbreviations, Klein and Kopf (2019), based on online survey data, suggested that *-s* plurals might replace *-ene* plurals even before they could be widely established.² At the same time, they pointed out the need for studies on native Swiss German nouns rather than loanwords, especially in cases where competition between *-ene* and *-s* plurals is possible (2019:46). Outside Switzerland, some anecdotal instances have been documented, such as in Northern Bavarian (Rowley, 1997:158-160) and Highest Alemannic in Austria (DiÖ, 2022). In turn, Kopf (2014:206f.) did not find any signs of diffusion among Low Alemannic speakers from southern Germany, which might be related to an effect of the sociolinguistic situation: while dialects are more vigorous in German-speaking Switzerland, their rather moribund situation in Germany might impede innovativeness.

Aims, research questions, and hypotheses

As detailed above, personality traits related to conscientiousness, extraversion, and openness have been argued to play a crucial role in innovation diffusion, but empirical evidence is thin. This study investigates the impact of these traits on an emerging morphological marker, addressing the following research question:

How do the personality traits of extraversion, openness, and conscientiousness affect the diffusion of *-ene* plurals in Swiss German when age, gender, education, region, mobility, language attitudes and use, and social networks, are controlled for?

We hypothesize that openness and extraversion are positively related to the diffusion of *-ene* plurals since characteristics such as gregariousness, outgoingness, curiosity, and creativity have been discussed as factors boosting linguistic innovation. Conscientiousness, on the other hand, is assumed to exert a negative influence, since characteristics such as dutifulness and self-discipline are assumed to be associated with linguistic conservatism rather than innovation.

Methods

Participants

The sample consisted of one thousand speakers from the SDATS project (“Swiss German Dialects Across Time and Space”), a large-scale study on language variation and change in German-speaking Switzerland (Leemann, Jeszenszky, Steiner, Messerli, & Studerus, 2020b). The speakers came from 125 localities (i.e., eight speakers per locality³), balanced across gender and age cohort (20-35 years old; 60+ years old). They had grown up and lived in the same place for most of their lives, and at least one of their parents came from the same region. Further, their daily travel time was required to not exceed the Swiss average of approximately two hours, and we aimed for a representative sample regarding educational background (FSO, 2019). Multilingual speakers were not excluded from the study; however, they were required to speak Swiss German as their first and main language. Since all Swiss German speakers are proficient dialect users, no assessment of dialect competence was needed.

Table 1. *-ene* plural items (frequency is indicated on an index from 1 = rare to 7 = frequent, see <https://www.dwds.de/d/worthaeufigkeit> for details)

Item, potential <i>-ene</i> plural	Dominant traditional plural form	Frequency (DWDS, 2022)
<i>Sohle, Sohlene</i>	<i>Sohle-ø</i> (soles-F.PL)	4/7
<i>Tanne, Tannene</i>	<i>Tanne-ø</i> (firs-F.PL)	3/7
<i>Rose, Rosene</i>	<i>Rose-ø</i> (roses-F.PL)	4/7
<i>Brügg, Brüggene</i>	<i>Brügg-e</i> (bridges-F.PL)	5/7
<i>Thema, Themene</i>	<i>Thema-ø</i> / <i>Them-e</i> (topics-N.PL)	6/7

Materials

Five lexemes were selected to investigate the diffusion of *-ene* plurals (see Table 1).

Aside from the basic criterion of selecting common and familiar words, the focus was on the main type of disyllabic feminine nouns ending in *-e* which traditionally take a zero plural in most dialects (items 1-3 in Table 1). *Sohle* and *Tanne* were already elicited in the historical atlas, where no *-ene* plurals were documented (SDS III, 1975, 183/186). *Brügg* is apocopied in the singular in most dialects and was selected to investigate the appearance of the *-ene* suffix in a category where it would not be needed for morphological opposition. Finally, besides testing the diffusion to neuter nouns, *Thema* was chosen to investigate *-ene* plurals in (abstract) loanwords that were discussed in the previous literature. In addition to the five target items, *Chuchi - Chuchene* ‘kitchens’ was integrated to test whether the traditional *-ene* plurals in feminine *-i* nouns are still in use today.

Procedure

Data collection took place between February, 2020 and December, 2021. The linguistic material was gathered in a traditional 2-3-hour dialect interview, following a similar elicitation paradigm to the historical atlas (SDS, 1962-2003) to ensure comparability between the two datasets. Due to the COVID-19 pandemic, 76.2% of all interviews needed to be conducted remotely via videoconferencing (see Leemann, Jeszenszky, Steiner, Messerli, & Studerus, 2020a). After the oral interview, participants completed an online questionnaire (~45 minutes). Written consent was obtained from all participants, and they were compensated with CHF 100 (= \$109 US, 01-25-2023).

The linguistic items were elicited orally as part of the dialect interview. Given the early stages of diffusion of *-ene* plurals, we needed to focus on contexts in which they could be expected at a certain minimal frequency to allow for statistical analyses. Previous findings suggested that these suffixes may appear more frequently in isolated plural formation tasks than if the target items are embedded in a sentence or text (Catillaz, 1982; Nickel & Werth, 2022). Thus, the five items were elicited via isolated picture-naming tasks and, in the case of *Thema*, a sentence translation and completion task (i.e., participants were provided with the lexeme in Standard German and instructed to translate it into their local dialect and provide a plural form). These items were embedded in a block with eleven other plural tasks, and participants



Figure 2. Illustration of the two consecutive prompts for the elicitation of *Tanne* ‘fir’ in singular (left: “What do you call this tree?”) and plural (right: “What do you call these trees?”).

were explicitly instructed to produce singular and plural forms. An elicitation example is displayed in [Figure 2](#).

Data-coding involved the transcription of raw variants and the classification of inflection types. For statistical modeling regarding *-ene* plurals, a binary variable (“*-ene*” applied or not) was created. Occurrences were counted even if a participant stated *-ene* plurals as one of two or more possible forms, which happened only rarely. All predictor variables were based on data assessed via the participant questionnaire administered after the interview. Besides personality traits, a range of control variables were integrated into the analysis. A detailed analysis report along with the dataset may be downloaded from [osf.io](https://osf.io/ebmsw/) (<https://osf.io/ebmsw/>).

Personality traits

Analogous to previous studies (e.g., Tamminga, 2021; Yu et al., 2013), conscientiousness, openness, and extraversion were assessed via the Big Five inventory (see Satow [2012] for the standardized German version used in this study). Each scale consisted of ten items, which may be consulted in [Table 2](#) (see Section 1 of the analysis report online for the original German wording).

The items were presented as statements in random order, and participants had to indicate their agreement on a four-point Likert scale. Cronbach’s alpha values in the SDATS sample ranged between satisfactory 0.75 and 0.80, indicating reliable measurement of the constructs. Summary scores for each scale were obtained by calculating the mean of the ten items related to the respective personality traits, resulting in a numeric value of 1–4 (the higher the score, the stronger the respective personality trait). Agreeableness and neuroticism were not integrated in this analysis because no theoretical or empirical link between these constructs and the diffusion of *-ene* plurals was assumed to exist.

Control variables

To test whether the hypothesized personality effects hold true when major factors known to exert an influence on language variation and change are controlled for, the variables presented in [Table 3](#) were integrated into the analysis.

Table 2. Big Five items related to conscientiousness, extraversion, and openness

Conscientiousness	Extraversion	Openness
I am a very dutiful person.	I enjoy being with other people.	I always want to try new things.
I always complete my tasks very accurately.	I can quickly spread a good mood.	I am a curious person.
Even as a child I was very neat.	I am an adventurous person.	I travel a lot to get to know new cultures.
When I do things, I always take a systematic approach.	I like to be the center of attention.	I would prefer everything to stay as it is. (inversed)
I have my principles and stick to them.	Usually, I prefer to be by myself. (inversed)	I like to discuss things.
Even small fines make me uncomfortable.	I am a loner. (inversed)	I always enjoy learning new things.
Even small sloppiness bothers me.	I like to go to parties.	I love to spend time with art, music, and literature.
I make sure the rules are being followed.	I am active in many clubs.	I am very interested in philosophical questions.
Once I make a decision, I stick with it.	I am a talkative and communicative person.	I read a lot about scientific topics, new discoveries, or historical events.
I never make careless mistakes.	I am very sociable.	I have many ideas and a vast imagination.

Table 3. Structure of control variables added to the fully adjusted mixed effects model

Variable	Levels, specifications
Age cohort	Binary: older (60+), younger (20-35)
Gender	Binary: female, male
Education	Four categories based on highest education level (SERI, 2019): secondary (vocational) baccalaureate, secondary vocational education, tertiary vocational education, university degree
Region	Categorical: eight main dialect regions in German-speaking Switzerland: Aargau (AG), Bern (BE), Central Switzerland (LU, OW, NW, ZG, SZ, UR), Southwestern Switzerland (FR, VS, TI), Grisons (GR), Northeastern Switzerland (SH, TG, AR, AI, SG, GL), Northwestern Switzerland (BS, BL, SO), Zurich (ZH), see Figure 3
LMI	Numeric Linguistic Mobility Index (range 0-6; the higher the score, the more mobile; see Jeszenszky, Steiner, & Leeman, in review)
DSP	Numeric Dialect Standard Profile: between -10 (standard-dominant) and +10 (dialect-dominant)
SNI	Numeric Social Network Index based on the three closest contacts (range 0-1; the higher the score, the looser the network; see analysis report online, Section 2.3)

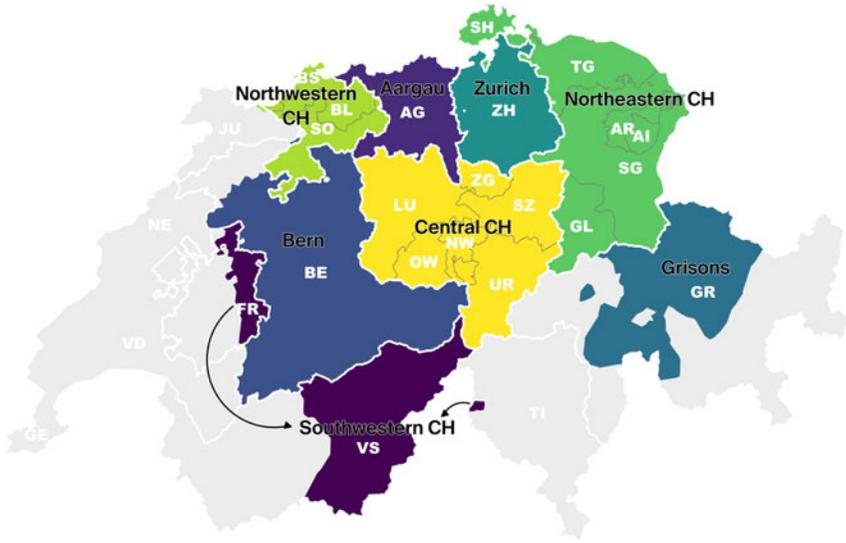


Figure 3. Dialect regions according to Hotzenköcherle (1984). CH = Switzerland.

While age, gender, education, region, mobility, and social networks were integrated into the analysis as genuinely important factors in language variation and change, the Dialect Standard Profile (DSP) was included due to the discussion of *-ene* plurals converging toward or diverging from the standard language. The DSP was compiled following the principles of the Bilingual Language Profile (BLP; Birdsong, Gertken, & Amengual, 2022), an established measure for language dominance in multilingual contexts, and was based on questionnaire data about productive and receptive use, as well as attitudes toward both varieties (see analysis report online, Section 2.2).

Data analysis

Statistical analyses were performed in *R* (R Core Team, 2022). Since personality traits might be subject to regional variation (Ebert, Gebauer, Brenner, Bleidorn, Gosling, Potter, & Rentfrow, 2022), the data were examined for potential patterns via *ggmap* (Kahle & Wickham, 2013) and Moran's *I* tests for spatial autocorrelation. Subsequently, logistic mixed-effects models were fitted via *lme4* (Bates, Maechler, Bolker, & Walker, 2015). Influences of personality traits on the diffusion of *-ene* plurals were tested by comparing an unadjusted model with conscientiousness, extraversion, and openness as sole fixed effects to a fully adjusted model including all control variables and potential interactions, of which only those with $p < .05$ were retained. In both models, random intercepts were entered for speaker and item to allow for subject- and word-specific variation.⁴ To test for collinearity between predictors, variance inflation factors (VIFs) were computed. Since all VIFs were close to 1, no collinearity issues were expected.

As an additional close-up, speakers were assigned to Rogers' (2017) adopter categories based on their total number of *-ene* plurals to examine personality-related variation between earlier and later adopters.

Results

The following section is divided into three parts. First, the focus is set on the outcome variable by presenting variation and change in *-ene* plurals in real and apparent time. Second, effects of conscientiousness, extraversion, and openness on the diffusion of *-ene* plurals are presented by comparing a personality-only model to a fully adjusted model including all control variables. Third, different adopter groups are compared in terms of their personality.

Diffusion of -ene plurals in real and apparent time

While traditional *-ene* plurals in feminine nouns ending in *-i* (as in *Chuchi - Chuchene*) have been proven to be still in use today, the innovative use measured by the five items *Sohle*, *Tanne*, *Rose*, *Brügg*, and *Thema* increased from no occurrences in the historical data to an average of 4% in the currently older cohort and 21% in the younger cohort (see analysis report online, Section 3.3 for a graphical representation). Figure 4 shows the predicted probability of *-ene* plurals for both SDATS cohorts, computed based on the fully adjusted mixed-effects model presented in Table 6. Based on these model predictions, older speakers use *-ene* plurals with a probability of 0.17% to 5.34%. The probability in the younger cohort ranges between 1.8% and 40%. Besides age-related differences, the maps in Figure 4 reveal a regional stratification: While the probability of *-ene* plurals is very low in the alpine south, in the other regions we can observe an increase of expected *-ene* plurals from west to east.

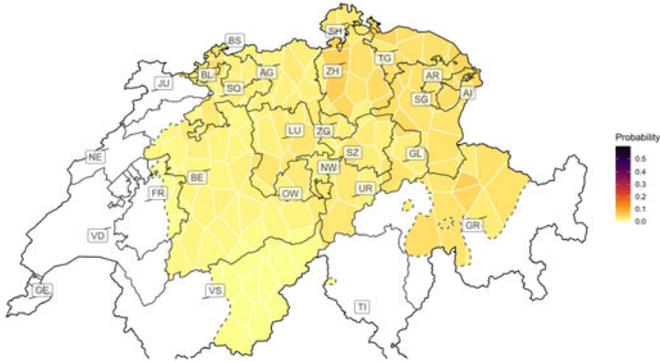
While Table 4 contrasts the innovative plurals with the most common competing traditional plural markers, Figure 5 presents a full account of all plural types in the SDATS data in both age cohorts.

Figure 5 indicates that although the frequency ranking was the same in both age cohorts (i.e., most *-ene* plurals for *Thema*, followed by *Sohle*, *Brügg*, *Tanne*, and *Rose*), younger speakers used the *-ene* suffix much more frequently overall (21% versus 4%). In the case of *Brügg*, which is traditionally apocopied in singular,⁵ the gain in *-ene* plurals from the older to the younger cohort (+13.6pp) was mostly due to a drop in *-e* plurals (i.e., *Brügg - Brügge*, -13pp). With regard to the other four variables, a comparison of the leftmost two bars across the two generations suggests that the increase of *-ene* plurals from the older to the younger cohort (mean across the four items +17.3pp) was paired with a marked decrease in zero plurals (-15.2pp), while the shares of the other forms remained similar (i.e., -2.1pp). Related to the potential competition between *-ene* and *-s* plurals in nonnative nouns, distributions regarding *Thema* show that, even though the use of *-s* plurals increased somewhat from the older to the younger cohort, *-ene* plurals clearly prevailed against *-s* plurals (9% versus 2.2% in the older and 36.2% versus 7.2% in the younger cohort).

Distribution of personality traits and mixed-effects models

Both age cohorts exhibited similar, normal distributions regarding conscientiousness and openness. A slight difference was observed related to extraversion with somewhat higher scores for the younger cohort. Regarding regional variation, the mapped data

Predicted probability of ene-plurals
Older cohort (60+)



Predicted probability of ene-plurals
Younger cohort (20-35)

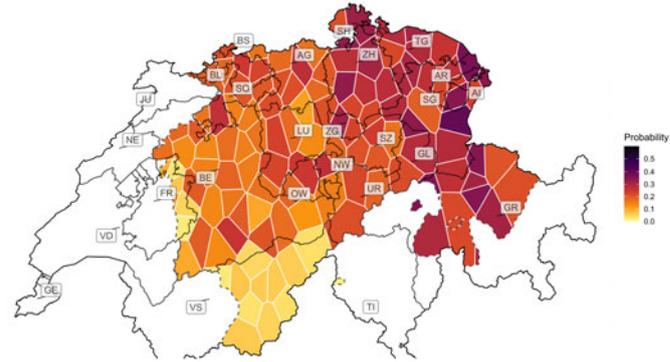


Figure 4. Predicted spatial distribution of *-ene* plural probability in the older (left) and younger (right) SDATS cohort.

Table 4. *-ene* plurals versus dominant traditional plural forms across age cohorts

Item	Dominant traditional plural markers	Use of traditional markers		Use of innovative <i>-ene</i> plurals	
		Older cohort	Younger cohort	Older cohort	Younger cohort
<i>Sohle</i>	∅	74.4%	53.6%	5.2%	29.2%
<i>Tanne</i>	∅	75.4%	65.6%	2.2%	15.4%
<i>Rose</i>	∅	87.4%	81.4%	0.0%	6.6%
<i>Brügg</i>	-e	80.4%	67.4%	4.0%	17.6%
<i>Thema</i>	∅, -e	88.0%	55.6%	9.0%	36.2%

Table 5. Fixed effects of the unadjusted model (total $n = 4995$)

Fixed effects	β (Log Odds)	SE	z	CI _{2.5}	CI _{97.5}	p
Intercept	-3.92	1.11	-3.53	-6.10	-1.74	<0.001
Conscientiousness	-1.16	0.23	-4.93	-1.62	-0.70	<0.001
Extraversion	0.96	0.22	4.27	0.52	1.40	<0.001
Openness	0.29	0.21	1.35	-0.13	0.70	0.176

Note. Predicted outcome = *-ene* plural applied; groups: speaker: 999; item: 5.

suggested no effects, which was confirmed by the Moran's I tests (see analysis report online, Section 3.4 for details).

Table 5 details the output of the unadjusted logistic mixed-effects model with the scores of the three personality traits as fixed factors and speaker and item as random factors. In Figure 6, the fixed effects are displayed visually.

As can be deduced from Table 5 and Figure 6, the unadjusted model suggested a substantial negative effect for conscientiousness (-1.16 [± 0.23], $z = -4.93$, $p < 0.001$); this is, the higher the score, the lower the predicted probability of using *-ene* plurals. The effect for extraversion pointed in the opposite direction, with more extraverted speakers having higher odds of using *-ene* plurals (0.96 [± 0.22], $z = 4.27$, $p < 0.001$). For openness, the model suggested a weak and highly uncertain trend (0.29 [± 0.21], $z = 1.35$, $CI_{2.5-97.5} = -0.13-0.70$, $p = 0.18$).

While the negative effect of conscientiousness remained robust (-0.76 [± 0.21], $z = -3.60$, $p < 0.001$), the positive effect for extraversion weakened (0.37 [± 0.20], $z = 1.83$, $CI_{2.5-97.5} = -0.03-0.77$, $p = 0.068$) when entering the control variables. Partly, this is related to the age effect: With the younger speakers being the slightly more extraverted ones, entering age cohort as a predictor may have contributed to the weakening of the extraversion effect. In addition, a post hoc analysis revealed an influential outlier in the data. An atypical speaker from Northwestern Switzerland had exceedingly frequent use of *-ene* plurals but extremely low values

Table 6. Fixed effects of the fully adjusted model (total $n = 4970$)

Fixed effects	β (Log Odds)	SE	z	CI _{2.5}	CI _{97.5}	p	% -ene plurals	n
Intercept	-4.49	1.13	-3.96	-6.71	-2.26	<0.001		
Conscientiousness	-0.76	0.21	-3.60	-1.18	-0.35	<0.001		
Extraversion	0.37	0.20	1.83	-0.03	0.77	0.068		
Openness	0.30	0.21	1.41	-0.12	0.71	0.158		
Age cohort (versus older)	Reference level						4.1%	2475
younger	1.91	0.35	5.46	1.23	2.60	<0.001	21.0%	2495
Gender (versus female)	Reference level						13.2%	2480
male	-0.21	0.18	-1.20	-0.56	0.13	0.229	12.0%	2490
Education (versus [voc.] baccalaureate)	Reference level						15.3%	1085
Secondary voc.	0.16	0.24	0.65	v0.31	0.63	0.516	11.6%	2100
Tertiary voc.	-0.60	0.33	-1.82	-1.25	0.05	0.069	7.7%	635
University	-0.20	0.25	-0.80	-0.69	0.29	0.422	14.5%	1150
Region (versus Aargau)	Reference level						12.7%	440
Bern	-0.31	0.35	-0.89	-1.00	0.38	0.376	10.6%	1000
Central CH	0.13	0.36	0.38	-0.57	0.84	0.707	13.5%	795
Southwestern CH	-1.78	0.43	-4.15	-2.62	-0.94	<0.001	4.3%	700
Grisons	0.48	0.43	1.12	-0.36	1.32	0.265	17.2%	360
Northeastern CH	0.56	0.34	1.66	-0.10	1.23	0.098	16.6%	995
Northwestern CH	-0.11	0.42	-0.27	-0.93	0.71	0.790	12.8%	400
Zurich	0.84	0.44	1.91	-0.02	1.69	0.056	17.1%	280

Linguistic Mobility Index (LMI)	0.12	0.10	1.19	-0.08	0.32	0.235
Dialect Standard Profile (DSP)	0.02	0.05	0.46	-0.07	0.12	0.649
Social Network Index (SNI)	-1.19	1.42	-0.84	-3.98	1.60	0.402
Age cohort younger*SNI	3.21	1.59	2.02	0.10	6.32	0.043

Predicted outcome = *-ene* plural applied; groups: speaker: 994; item: 5. For categorical variables, % *-ene* plurals and *n* are reported for each level.

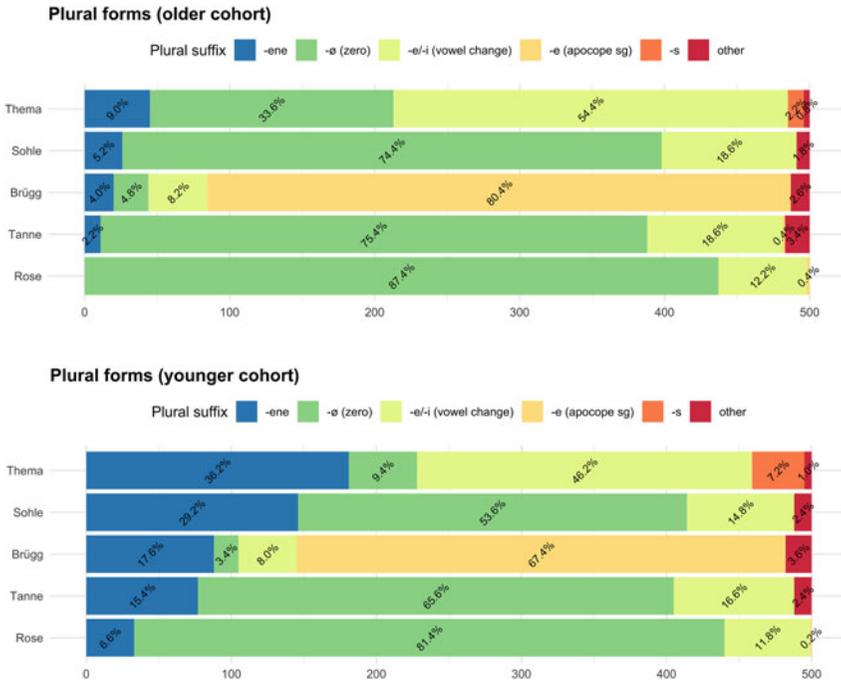


Figure 5. Proportional distribution of plural formation types in the older (top) and younger cohort (bottom). Sg = singular.

in extraversion and otherwise a rather conservative background (low mobility, rather closed network, etc.).⁶ When the model was rerun without this outlier, the effect for extraversion increased (0.43 [±0.21], $z = 2.1$, $p = 0.036$; full model output in analysis report online, Section 4.3).

Among the control variables, the strongest effect was observed for age cohort, indicating that speakers in the younger cohort were much more likely to use *-ene* plurals than older speakers (1.91 [±0.35], $z = 5.46$, $p < 0.001$). Further, the model revealed regional effects, most prominently so for the Southwest, where speakers were predicted to be much less likely to produce *-ene* plurals (see also Figure 5). Lastly, an interaction between age and social networks slightly below the $p = .05$ level was identified, indicating diverging effects of social networks for the two age cohorts (see plot at the bottom right-hand side of Figure 7).

Cross-comparing *-ene* adopter groups

Since the statistical modeling yielded intriguing results related to conscientiousness and, to a lesser degree, extraversion, an additional close-up analysis of the distribution of these traits among earlier and later adopters of *-ene* plurals was conducted. Therefore, speakers were assigned to Rogers’ (2017) adopter categories based on their total number of *-ene* plurals (Figure 8). Rogers’ small group of innovators comprises 2.5% of the population, which roughly corresponds to the proportion of speakers in our sample who produced four to five *-ene* forms (3.3%). Speakers with two to

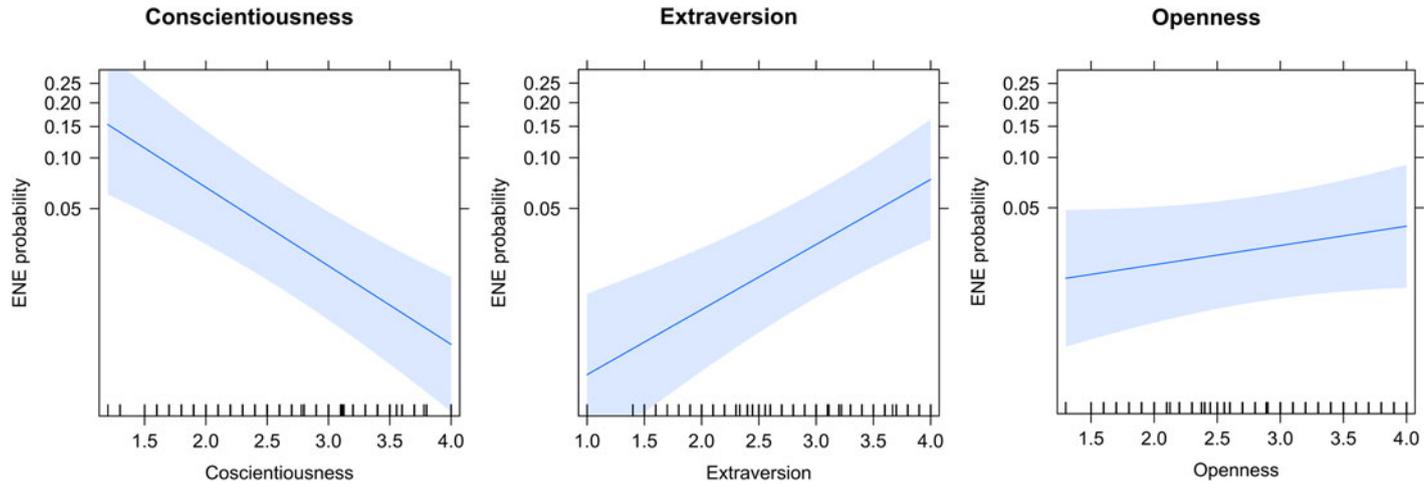


Figure 6. Effect plots for conscientiousness, extraversion, and openness. The output from the fully adjusted model is displayed in [Table 6](#) along with effect plots in [Figure 7](#).

Adopter categorisation according to Rogers (2017)

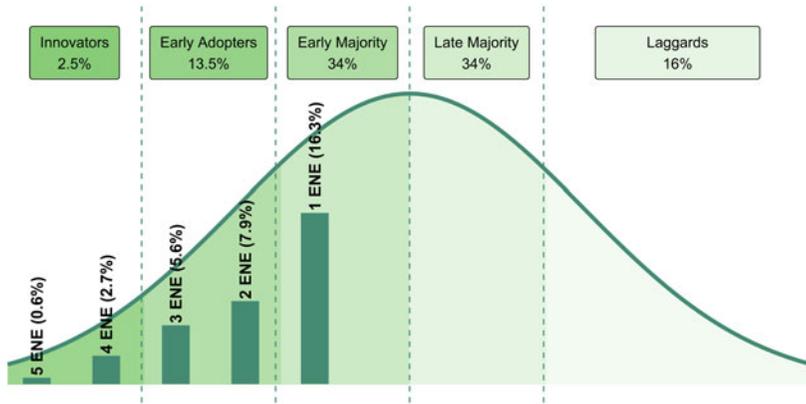


Figure 8. Speaker assignment to adopter categories based on the number of *-ene* plurals produced.

three *-ene* plurals amounted to 13.5% of the sample and were assigned to the early adopter group accordingly. Another 16.3% used only one *-ene* form, making up roughly the first half of Rogers' early majority. The three resulting *-ene* adopter categories were contrasted with the remaining speakers who did not use the innovation (i.e., 66.9%).

Figure 9 presents distributions of conscientiousness and extraversion across the created *-ene* adopter groups. Overall, early adopters, and especially innovators, showed divergent distributions, while the early majority strongly resembled the rest of the sample who did not produce any *-ene* plurals. Regarding extraversion, based on group means, one could suspect a potentially nonlinear relationship, with the values increasing from innovators (3.02) to early adopters (3.08), before sharply decreasing again in the early majority group (2.94). However, one must bear in mind the drastically varying sample sizes and the uncertainty related to it, particularly with the innovator group comprising only thirty-three speakers. In addition, this group included the above-discussed lower bound outlier which heavily affected the central tendency. Nevertheless, a potential nonlinear effect was tested and ruled out in a mixed-effects GAM using the package *gam4* (Wood & Scheipl, 2020, see analysis report online, Section 6). What most distinguished the innovators and early adopters was their conscientiousness: The lowest mean values were found for the innovators (2.51), compared to 2.71 for early adopters, 2.77 for early majority, and 2.84 for the remaining speakers.

Discussion

This study focused on interrelations between personality and language change. We hypothesized conscientious speakers to act as conservators of traditional forms, while extraverted and open speakers may foster change as measured by the diffusion of *-ene* plurals in Swiss German. This discussion starts with reflections on the spread of *-ene* plurals as the linguistic outcome variable. The second and main part provides

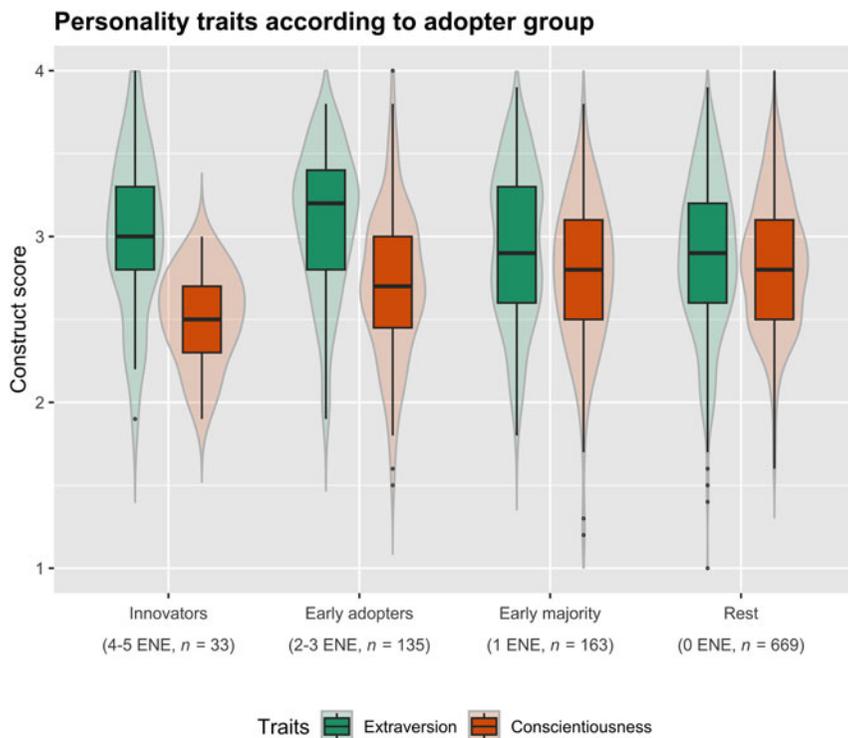


Figure 9. Conscientiousness and extraversion across adopter groups.

an interpretation of the intertwining of personality and language change, with a focus on conscientiousness as the most important effect in our analyses.

-ene plurals in Swiss German in their early stages of diffusion

Our data demonstrate the diffusion of the *-ene* suffix from disyllabic feminine nouns ending in *-i* to a range of further nouns, providing large-scale empirical support to previous claims mainly based on anecdotal evidence (e.g., Christen, 1997, 1998; Graf, 2015; Landolt, 2010). Unsurprisingly, the main factors driving this change seem to be age and region, which corroborates, on a large scale, Catillaz's (1982) findings from two small villages. The sharp increase in the use of the innovative *-ene* plurals across generations in the historical and contemporary data points toward a change in both real and apparent time. The apparent-time effect was confirmed inferentially, with age cohort constituting the most important predictor among the control variables in the fully adjusted model. Further, an interaction between age and social networks was identified, indicating that social networks are important for younger but not for older speakers. At the same time, the network index in this paper has several drawbacks that are detailed in the Limitations section. Regional effects were predicted by the model as hypothesized, with an increasing probability for *-ene* plurals from west to northeast, sharply contrasting with the southwestern region, where

speakers were predicted to produce virtually no *-ene* plurals. This result can be explained largely by the formal constraints outlined previously, that is, the already existing number opposition in the Southwest impeding the establishment of a novel marker.

Regarding between-item variation, the fact that *Thema* ‘topic’ took the *-ene* suffix most often was somewhat surprising, given the fact that neuter nouns have only played a peripheral role in the literature. In addition, number opposition could be accomplished by a word-final vowel change in all dialects (*Thema* - *Theme*), and adding the *-ene* suffix might seem a rather unnecessary complication. It is, however, worth noting that the Standard German plural of *Thema* is *Themen*, and the singular *-a* is not treated as part of the root. Hence, this finding could also be taken as a particular instance of standard convergence. Additionally, a frequency effect might be at play with *Thema* constituting the most frequent among the five items (6/7, see Table 1). As for the potential competition between *-ene* and *-s* plurals in loanwords, our finding may be interpreted as contradicting Klein and Kopf (2019). Apart from their smaller sample and the data collection mode, this might, however, be explained by intralinguistic features (for instance, Klein and Kopf [2019:45-46] reported high between-item variation with two particular lexemes exhibiting comparatively high *-ene* proportions, and they did not integrate abstract nouns). To gain further insights though, a more detailed examination of a series of similar loanwords would be needed.⁷

In relation to the argument of morphological differentiation, the *-ene* proportions in *Brügg* ‘bridge’ were also higher than expected, since opposition is accomplished with the apocopied singular form in most dialects (*Brügg* - *Brügge*). Besides its high frequency (see Table 1), this could be explained by the trend toward greater explicitness as discussed in Klein and Kopf (2019:32-35, 46), with the more complex *-ene* extending the simple schwa.

The other three items (*Sohle*, *Tanne*, *Rose*) were expected to behave somewhat more similarly since all of them are disyllabic feminine nouns with traditional zero plurals. Reasons for variation might be morphophonemic or semantic (e.g., gemination in *Tanne* versus *Tane* in some dialects, where the realization of the plural *Tanene* seems phonotactically challenging; or *Rose*, which might refer to both a single flower and a whole bush, thus considered as a *plurale tantum*). However, since such intralinguistic effects were not the core concern of the present study, these are rather speculative interpretations.

Personality traits and their effects on language change

Regarding overall distributions of the three personality traits, our results were within the expected range. The minor age-related differences in extraversion were probably related to items encompassing social activities (e.g., being active in many clubs), which are expected to be more frequent among younger speakers. Further, contrary to what Ebert et al. (2022) suggested for the US, our distributions seemed not to be patterned spatially.

In terms of how personality mediates the diffusion of *-ene* plurals, *openness* did not emerge as a distinctive characteristic of innovative speakers in our data. Based

on the assumption that more curious, excitable, and unconventional speakers lead language change, the empirical negligibility of this effect seems somewhat surprising. However, a closer inspection reveals that curiosity and excitableness account only partly for this trait, while other characteristics are instead related to intellectuality and engagement with art, culture, and science (see Table 2), that is, aspects that seem rather independent from linguistic innovation.

In contrast to the null result in Tamminga (2021), our models indicated a positive trend for *extraversion*, which was somewhat disrupted by the control variables and by an outlier. With these restrictions in mind, the detected trend corroborates findings from Denis (2011) on gregariousness and implies that more outgoing, sociable, and enthusiastic speakers are more likely to show innovative morphosyntactic behavior. As already mentioned, related to Denis' (2011) assessment of gregariousness, *extraversion* can be seen as the personality trait most closely connected to social factors. Extraverted speakers are said to be highly sociable and well connected. Hence, innovative behavior of their peers might influence these speakers, and they might adopt new forms more rapidly. On the other hand, extraverted speakers might be the leaders themselves, who introduce and spread innovative forms with their ability to influence others due to their assertiveness and self-confidence (see also Yu, 2013:203). In this context, similar to Cheshire *et al.* (2008), Eckert's (2000) concept of brokering can be useful for interpreting the reasons why extraverted speakers can act as change leaders: These speakers may manage to act as successful brokers by exerting influence on various social groups, and thus fostering innovation diffusion by transmitting them from group to group.

The most crucial effect in our data was revealed for *conscientiousness*. This effect remained robust across both models, and it emerged as the trait due to which the adopter categories could be distinguished most clearly. Our analyses suggested a negative association between conscientiousness and innovative behavior related to the novel plural forms, corresponding to the trend detected in Yu *et al.* (2013). A closer inspection of the construct reveals that this finding may be explained by two sets of characteristics associated with conscientiousness, which might mediate the speakers' linguistic behavior. First, conscientious individuals are order-loving, precise, and diligent, accomplishing their tasks systematically and with prudence (see questionnaire items in Table 2; McCrae & Costa, 1987:85). This accuracy and systematicity potentially contributes to a more rigid monitoring of their own and others' linguistic behavior, especially with regard to a highly salient marker such as the *-ene* suffix. Second, they are people who stick to their principles, who make sure that rules are followed and who dislike sloppiness. Based on these characteristics, it is not surprising that conscientiousness has recurrently been associated with conservatism (see Xu, Soto, & Plaks, 2021 for a study in the political domain). Combined with enhanced monitoring, this conservatism might manifest itself on a linguistic level: The novel *-ene* forms may be disruptive for these speakers, and they might be reluctant in taking them up, thus reinforcing conventional linguistic norms. In contrast, the low-conscientious innovators might be more progressive and pay less attention to their own and others' speech, thus taking up novel forms more rapidly. Drawing on this latter explanation, low-conscientious speakers may be characterized as loaners rather than leaders, adopting new forms in a relatively subconscious manner.

The question remains as to why we detected these intriguing effects for conscientiousness and extraversion, while other studies that assessed these traits similarly, such as Tamminga (2021) or Yu et al. (2013), did not. A possible explanation for the diverging results is that the effects depend on the linguistic phenomenon under scrutiny. Tamminga's (2021:271) vowel sets were long-term changes that have been investigated since Labov's early work in Philadelphia, whereas *-ene* plurals in Swiss German are a particular phenomenon that only emerged recently. Yu et al. (2013) deviated even further from the present study in terms of their dependent variable, since they focused on phonetic imitation. Based on the diverging results, conscientiousness might be interpreted as a factor impeding the general adoption of linguistic innovations rather than mediating short-term accommodation at the microlevel of phonetic imitation. Besides the linguistic variable of interest, the overall sociolinguistic situation might play a role, with the high status of dialects in German-speaking Switzerland fostering personality effects on linguistic behavior. A final reason as to why we identified these effects relates to innovative individuals constituting only a small fraction of the population who, in Labovian terms, sociolinguistically stand out in sharp contrast to their peers (Labov, 2001:384). While Tamminga (2021, $n = 56$) and Yu et al. (2013, $n = 93$) had much smaller and homogeneous samples, our data may have enabled us to identify this small group of speakers who were ahead of their peers in terms of their innovative linguistic behavior.

Limitations

One limitation of this study is related to the general design of the SDATS project. Due to the large sample size and the main goal of investigating language change as broadly as possible, the SDATS project was limited concerning the depth at which individual phenomena could be investigated, resulting in only five *-ene* plural tokens. This number should be increased, especially if intralinguistic influences are to be examined in more detail. Additionally, the focus on isolated items may be problematic, since it ignores the social context in which the forms may be uttered and the social meaning attached to them (Moore, 2020). An analysis of spontaneous speech interaction data would be needed to reveal the pragmatic functions and potential social meaning of morphological markers such as *-ene* plurals, for example, that this greater explicitness in expression is connected to stronger emphasis of certain social aspects.

Second, the social network index is related to several drawbacks. While this metric was compiled in terms of comparability in a large speaker sample and usability as a predictor in statistical modeling, it only reveals a fraction of social networks. It is ego-centric in nature, capturing only the three closest ties; we can only assume that speakers reporting closer ties are part of denser networks (see Sharma, 2017, for a critical discussion). In addition, since it encompasses private contacts only, we cannot account for multiplexity. We believe, however, that a more detailed analysis of social networks and their intertwining with personality traits may be crucial for further research, since this could not only sharpen understanding of the intersection between personal and social factors, but it could also help find answers to the core question of whether it is the peripheral, unconventional speakers with loose ties or the centrally connected, assertive speakers who lead language change.

Third, linguistic innovativeness in this paper needs to be critically evaluated. As explained in the introduction, *-ene* plurals were chosen due to the unique opportunity to investigate a phenomenon in its early stages of diffusion, allowing the identification of speakers who are linguistically ahead of others. At the same time, it is important to bear in mind that speakers innovating in the domain of *-ene* plurals might not necessarily innovate in other domains. Investigations of further phenomena would be needed to test whether our identified innovative behavior is restricted to this very phenomenon or if our innovators prove to be general leaders. In addition, it is perhaps in the nature of things that the most interesting speakers make up the smallest proportions of the sample (i.e., $n_{\text{innovators}} = 33$ and $n_{\text{early adopters}} = 135$), which further limits the scope and certainty of the findings.

Conclusion

The present study examined potential effects of conscientiousness, extraversion, and openness on an ongoing linguistic change in German-speaking Switzerland. Our findings highlight the complex and multifaceted nature of innovation diffusion and reveal that personality traits might have been unjustly neglected in the empirical study of language variation and change. Our results seem to approach the idea of the saccadic leaders in the Labovian sense (Labov, 2001:383), with the comparatively small group of innovative speakers standing out from their peers in terms of their personality. More specifically, innovative behavior was shown to be associated with low conscientiousness and—to a certain degree—high extraversion, while openness was distributed more evenly across adopter categories. Drawing on characteristics associated with the constructs discussed, we further speculate that low-conscientious speakers might rather be loaners, while highly extraverted speakers with their successful brokering strategies could act as leaders in transmitting innovations from one social group to another.

We believe that these insights can contribute to a better understanding of the connection between personality and language change. The present study is only a first step, limited by its focus on one particular phenomenon and by its questionnaire-based assessment of personality traits. In addition, great potential may lie in a more rigorous examination of the intertwining of personality and social networks in relation to their influence on language variation and change. Nevertheless, the finding that, besides age and region, the traits of conscientiousness and extraversion were the most important predictors in our models urgently calls for a more serious consideration of such effects in future studies.

Acknowledgments. This study was funded by the Swiss National Science Foundation grant no. 181090. We thank Melanie Studerus, Jan Messerli, Linus Oberholzer, Jonathan Blum, Lara Grunder, Michelle Käch, Corinne Lanthemann, Thea Maseró, Laura Müller, Janka Szücs, Manuela Troxler, Nina von Allmen, and Jessica Wagner for their help with data collection.

Competing interests. The authors declare none.

Notes

1 Landolt (2010:105) further speculated about potential *-ene* plurals in monosyllabic masculine nouns. However, this seems to be a highly exceptional phenomenon, and it did not occur in any of the three corresponding lexemes elicited in SDATS.

- 2 Note, however, that only a few items in Klein and Kopf's (2019) study could take the *-ene* plural, and large between-item variation was observed.
- 3 See Jeszenszky, Steiner, and Leemann (2021) for details on the survey site selection.
- 4 Note that the sample size in both models varies slightly due to missing data of six speakers ($n_{\text{unadjusted model}} = 999$; $n_{\text{fully adjusted model}} = 994$).
- 5 The few cases of zero plurals in *Brügg* refer to nonapocopied singulars, as in *Brügge - Brügge*.
- 6 As a very young student, this speaker might have been influenced by a linguistically progressive environment at school and might have adopted this innovation early despite his conservative background. Unfortunately, our quantitative data only allows us to speculate about such influences.
- 7 Consider *Firma - Firmene* 'company,' for which anecdotal instances have not only been documented in Switzerland (e.g., Nübling, 2008:318) but also in the Highest Alemannic area in Austria (DiÖ, 2022).

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Cite this article: Steiner C, Jeszenszky P, Stebler V, Leemann A (2023). Extraverted innovators and conscientious laggards? Investigating effects of personality traits on language change. *Language Variation and Change* 35, 1–28. <https://doi.org/10.1017/S0954394523000091>