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Investigating Gender Assignment Strategies in Mixed Purepecha–Spanish Nominal Constructions

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Abstract: Purepecha has no grammatical gender, whereas Spanish has a binary masculine–feminine system. In this paper we investigate how early sequential Purepecha–Spanish bilinguals assign gender to Purepecha nouns inserted into an otherwise Spanish utterance, using a director-matcher production task and an online forced-choice acceptability judgement task. The results of the production task indicate a strong preference for masculine gender, irrespective of the gender of the noun's translation equivalent, the so-called "masculine default" option. Participants in the comprehension task were influenced by the orthography of the Purepecha noun in the *-a* ending condition, leading them to assign feminine gender agreement to nouns that are masculine in Spanish, but preferred the masculine default strategy again in the *-i/-u* ending condition. The absence of the "analogical criterion" in both tasks contrasts with the results of some previous studies, underlining the need for more comparable data in terms of task type. Our results also highlight how task type can influence the choices speakers make, in this context, in terms of the choice of grammatical gender agreement strategy. Task type should therefore be carefully controlled in future studies.

Keywords: code-switching; grammatical gender; mixed nominal constructions; Purepecha; Spanish; gender assignment strategies; task effect

1. Introduction

In this paper we investigate how Purepecha–Spanish bilinguals assign gender to Purepecha nouns inserted into otherwise Spanish utterances. Such mixed utterances are examples of intra-sentential code-switching, defined as the use of elements from two or more languages in a single sentence (see, e.g., Parafita Couto et al. 2015). The study of code-switching amongst Purepecha speakers is in its infancy, despite an observation made 30 years ago (based on data collected in the 1950s and 1960s) that "Tarascan[1] is replete with Spanish loans and a great deal of routine conversation can be conducted in either language, the speaker converting with facility between sets of formulae—a sort of potential instant conversion" (Friedrich 1984, p. 58). Prolonged contact between the two languages, reaching back over 500 years, has led to a situation of relatively stable bilingualism amongst the approximately 125,000 Purepecha speakers, most of whom live in Michoacán, centre-west Mexico.

This linguistic situation lends itself to the systematic study of code-switching, especially given that Purepecha and Spanish differ quite considerably in various grammatical features. Purepecha is a strongly agglutinative language that uses suffixation as its primary means of word formation.

[1] Tarascan is an outdated term used to refer to Purepecha, both the people and their language.

It is characterised by its extensive templatic morphology (all suffixes), including a set of between 30 and 50 spatial location suffixes whose use is frequent in verb forms to indicate the place of an event or action. It lacks certain features that are present in Spanish, including grammatical gender, the definite article and obligatory plural marking on nominals. Word order is relatively flexible, largely due to the sevenfold case system and explicit person marking (subject and object) on verbs. As such, a number of grammatical conflict sites can be identified, namely points at which the two grammars differ, including the one we investigate in this paper, namely the presence or absence of grammatical gender.

A language is said to have a system of grammatical gender if agreement is present between the noun and other words associated with the noun (Fedden and Corbett 2017, p. 6; see also Corbett 1991). This agreement can occur on articles and adjectives, as exemplified by the contrast in German in (1a–b), or in past verbal forms, such as the Russian examples in (1c–d).

1. a. ein-ø jung-er Mann
ART.INDEF.-MASC young-MASC man
'A young man.'[2]

b. ein-e jung-e Frau
ART.INDEF-FEM young-FEM woman
'A young woman.'

c. он сидел и читал
on sidel-ø i chital-ø
he sit.IMPERF-MASC and read.IMPERF-MASC
'He was sitting and reading.'

d. она сидел-а и читала
ona sidela i chital-a
she sit.IMPERF-FEM and read.IMPERF-FEM
'She was sitting and reading.'

Grammatical gender is a common feature of Indo-European languages, but is largely absent in many parts of the world, including much of the Americas. Half of the sampled languages (n = 257) in the World Atlas of Language Structures (Corbett 2013), for example, have no gender system. Around 20% have two genders (as also found in Spanish, see Section 1.1), approximately 10% have three, and only 5% have four. Systems comprising five or more genders are in the distinct minority, at around 1% of the sample total. In the next section, we will offer an overview of how gender is encoded in Spanish, as well as more detail on the nominal construction in Purepecha and Spanish more broadly.

1.1. Grammatical Gender and Nominal Constructions in Purepecha and Spanish

Purepecha has no grammatical gender. Nouns, as all words in the language, terminate in a vowel, often the *-a* in *-kwa*, the most common nominaliser. Other nominalising suffixes terminating in *-a* that occur are *-cha*, *-ka*, *-ma*, *-mpa*, *-nta*, and *-ta*, all likely fossilised classifying or nominalising elements (see Bellamy 2018), as in (2).

2. pire-kwa 'song' kuru-cha 'fish' japo-nta 'lake' sïra-ta 'smoke'

[2] The following abbreviations are used in this article: 1: first person, 2: second person, 3: third person, AOR: aorist, ART: article, ASS: assertive, DEF: definite, DIM: diminutive, FEM: feminine, INDEF: indefinite, MASC: masculine, IMPERF: imperfective, O: object, OBJ: objective, PL: plural, PRES: present, S: subject, SG: singular.

With reference to nominal constructions more generally, it is worth noting that nouns can take the plural marker *-icha* or *-cha* although its presence or absence is dependent on two hierarchies, one of animacy and one of definiteness (Chamoreau). Purepecha only possesses the indefinite article *ma*, which is also the numeral 'one', but no definite article. It generally precedes the noun it modifies, as in *ma achati* 'a/one man'. Adjectives can either precede or follow the noun, with no change in meaning or emphasis. They may also take the plural marker mentioned previously as well as the objective case marker *-ni*[3] (for a more in-depth presentation of Purepecha grammar, see (Chamoreau 2000, 2003; Foster 1969; Friedrich 1984)). An example including plural marking (on both the noun and adjective) and an adjective can be observed in (3).

3.	xuka-a-x-ka	eskwa-icha-ni	shungapiti-icha-ni
	have-3.PL.O-AOR-1/2.S.ASS	eye-PL-OBJ	green-PL-OBJ
	'I have green eyes.'	(Adapted from Chamoreau 2000, p. 100)	

There are, however, a small number of cases of differential verbal marking for masculine and feminine referents, such as 'to be old' whose root is *tharhe-* for men but *khuchi-* for women. Moreover, certain kinship terms differ according to whether the speaker (or "possessor" of said relative) is male or female (for more detail, see Chamoreau 2000, pp. 55–56).

Spanish, on the other hand, has a clear binary masculine–feminine gender system, where masculine is the default gender and feminine the marked gender (see Harris 1991; Roca 2005). Gender, as one would expect given its requirement to have scope outside of the noun, is marked on definite and indefinite articles, as well as explicitly on adjectives terminating in *-o* and *-a*, and personal pronouns, see (4).

4.	El	hombre	chiqu-ito	tom-a
	ART.DEF.MASC	man	small-DIM	drink-3.SG.PRES
	de	la	botella	roj-a
	PREP	ART.DEF.FEM	bottle.FEM	red-FEM
	'The small man drinks from the red bottle.'			

Liceras et al. (2016) draw a distinction between concord and agreement structures in Spanish with respect to grammatical gender. They define concord structures as containing a noun and an article that are made to agree in respect of their shared gender features, such as *la mesa roja* 'the$_{FEM}$ red$_{FEM}$ table$_{FEM}$'. Their notion of agreement, on the other hand, refers to verbal constructions where gender is marked outside of the noun phrase, for example the feminine adjective in a sentence such as *la mesa es roja* 'the table$_{FEM}$ is red$_{FEM}$' where the adjective 'red' agrees with the noun preceding the copula (see Liceras et al. 2016 for a more thorough treatment of the difference between these structures)[4].

Importantly for predictions relating to gender assignment of Purepecha lexical insertions (see Section 1.4), the phonological ending of a Spanish noun is a sound predictor of its gender; the overwhelming majority of nouns terminating in *-o* are masculine (99.87%), and those in *-a* feminine (96.30%)[5] (Parafita Couto et al. 2016, p. 306). Other endings, such as *-e*, *-i*, or *-u* can refer to either masculine or feminine nouns, such as *el héroe* 'hero.MASC', *la prole* 'progeny.FEM', *el espíritu* 'spirit.MASC' and *la tribu* 'tribe.FEM'.

With reference to other elements of Spanish nominal constructions, articles precede the noun they modify, as is also claimed to be the case in Purepecha (see, e.g., Chamoreau 2000; see also Table 1).

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[3] Purepecha possesses seven nominal cases, including the objective, which can mark both the direct and indirect objects of an utterance.

[4] It should be noted that we remain agnostic on the need to distinguish between concord and agreement structures in relation to the marking of grammatical gender. However, the distinction is worth mentioning since it is used to report and compare many of the results of gender assignment tasks reported in Liceras et al. (2016). As such, we refer to the distinction when appropriate when reporting results from this source in the present paper.

[5] Note that, on the basis of an unpublished dictionary count, 52% of Spanish nouns are masculine and 45% feminine, with the other 3% able to take either gender (Clegg 2010, p. 6). This division is roughly balanced, with a slight preference for the default gender, namely masculine.

Adjectives usually follow the noun they modify, although they can also precede the noun in certain conditions, usually relating to differentiation or, in some cases, the difference in placement marks a semantic difference (e.g., Butt and Benjamin 2013). Plural marking (-*s*) on the noun is separate to gender marking, and there is no nominal case system. A comparison of the features of the nominal systems in Purepecha and Spanish is presented in Table 1.

Table 1. The nominal constructions in Purepecha and Spanish.

Feature	Purepecha	Spanish
Definite article	N/A	el 'the$_{MASC}$', la 'the$_{FEM}$'
Indefinite article	ma 'one'	un 'a(n) $_{MASC}$', una 'a(n) $_{FEM}$'
Article placement	Art-N	Art-N
Grammatical gender	N/A	MASC (-o), FEM (-a) (canonical)
Adjective placement	N-Adj, Adj-N N-Adj-Adj, Adj-N-Adj	N-Adj, but Adj-N in certain conditions

Conflicting features in language pairs are prime test sites for probing issues related to how bilinguals deal with such conflicts, especially when they engage in code-switching. We review gender-based conflicts in code-switching research in the next section.

1.2. Previous Research on Gender Assignment in Mixed Nominal Constructions

It is widely accepted that code-switching is not a random combination of a bilingual's two languages, but rather it is constrained by a combination of structural and social factors. Much current code-switching research is concerned with identifying these constraints in order to build models of code-switching behaviour, which, in turn, inform models of grammar more generally (see MacSwan and McAlister 2010). This can be done by focusing on so-called conflict sites in bilingual grammars, that is, points where the two grammars differ (see Section 1.1). The presence or absence of grammatical gender in each of a bilingual speaker's two languages is an excellent example of such a conflict site and has been investigated in a number of language pairs using different methods and types of data (see also Section 1.3).

In their seminal study, Poplack et al. (1982) identify several possible conditioning factors for assigning gender to borrowed English nouns in Puerto Rican Spanish and Montreal French. They found that "none of the linguistic factors [. . .], except in the relatively rare case of physiological referent, completely determines gender assignment [...]—the process is variable" (Poplack et al. 1982, p. 25). They also found that the factors influencing gender agreement are language-specific, thereby making predictions regarding universal or cross-linguistic tendencies of gender assignment complicated.

Since Poplack et al. (1982), subsequent studies have brought to light three main strategies for gender assignment in mixed nominal constructions. The first strategy is a preference for using a default article, regardless of the gender of the translation equivalent, such as the Spanish–English *el cookie* 'the.MASC cookie' rather than *la galleta* 'the.FEM cookie' (see Valdés Kroff 2016). The data presented in Moyer (1993; see also Liceras et al. 2006) for simultaneous Spanish–English bilinguals in Gibraltar suggests that these speakers make use of such a strategy. Parafita Couto et al. (2016) conducted a multi-task study of gender assignment in mixed Spanish–Basque nominal constructions, combining naturalistic speech with elicitation and auditory judgement data. Basque lacks gender, while Spanish has a binary gender system, as presented in Section 1.1. The results of this study found that participants preferred to use the feminine article in Spanish, indicating a feminine default. Liceras et al. (2008), a study also based on both experimental and spontaneous data, report that adult L1 Spanish speakers and non-native speakers displayed a secondary preference for a masculine default article with an English noun in mixed noun phrases, whereas this preference was overridden by the "analogical criterion" (see below) in L1 Spanish speakers (see also Section 1.3 for more detail on the variation in strategy according to task type). In the absence of another factor that could indicate gender

in an English noun, Spanish–English bilinguals also resort to a masculine default strategy in 97.7% of cases (Jake et al. 2002, p. 83; see also Valdés Kroff 2016 for results corroborating this finding).

The second observed strategy is the use of the gender of the translation equivalent of the switched noun, such as the Spanish–English *la cookie* 'the.FEM cookie' following the gender of the Spanish word *la galleta* 'the cookie'. A strong tendency for such a strategy has been reported by Fuller and Lehnert (2000) for late sequential German–English bilinguals, although they also found a great deal of variation in the strategy adopted, with no single strategy applying to all contexts. Similarly, bilingual Italian–German children display a preference for the analogical criterion in mixed nominal constructions, although this preference is not absolute (Cantone and Müller 2008). Liceras et al. (2008) also report the use of this "analogical" strategy by L1 Spanish speakers in the same study where the masculine default is also found (see Section 1.3).

The third strategy is to take phonological cues from the ungendered language that coincide with gender assignment rules in the gendered language, such as *la coca cola*, where the *-a* ending of the noun is re-interpreted as a marker of feminine gender. An example of this strategy is the Basque–Spanish study mentioned above (Parafita Couto et al. 2016), where the authors explain the feminine default strategy as stemming from the phonological form of the Basque definite article, the suffix *-a*. The presence of this final vowel, which is a strong indicator of feminine gender in Spanish (see Section 1.1), triggered a preference for using the feminine article in Spanish (the gendered of the two languages).

Eichler et al. (2012, p. 237; following Cantone and Müller 2008) also report three categories of gender assignment for articles in switched nominal constructions between two languages with grammatical gender (here, German and one of French, Italian and Spanish or two of these three Romance languages), but frame them slightly differently to those outlined above, namely in terms of (i) the same gender, where the gender of the switched noun and its article is the same; (ii) different genders, where the gender of the switched noun is marked either on the article or the noun (i.e., either $der_{[\text{MASC}]}$ $soleil_{[\text{MASC}]}$ following the French $le_{[\text{MASC}]}$ *soleil* 'the sun' or $die_{[\text{FEM}]}$ $soleil_{[\text{MASC}]}$ following German $die_{[\text{FEM}]}$ *Sonne* 'the sun'), akin to what we refer to as an "analogical" strategy; and (iii) gender errors, which cannot be accounted for by the gender of either the switched or equivalent noun. Notably, this categorisation does not allow for a default strategy, either masculine or feminine as identified in other studies. Moreover, as we will observe in the following section, the type of task may also play a role in the gender assignment strategy adopted.

1.3. Production vs. Comprehension Tasks

Not only did some studies find variation in the gender assignment strategies adopted in different language pairs, but some also identified differences according to the types of bilingual speakers involved, the type of data collection method used, notably whether it comprised production (i.e., spontaneous or semi-spontaneous speech) or comprehension (i.e., processing) tasks, and also the type of structure tested (i.e., concord or agreement). Differential gender assignment behaviour is observable between simultaneous and sequential bilinguals. For example, L1 English–L2 Spanish bilingual adults in Trinidad and Tobago display a preference for the analogical criterion in mixed nominal constructions on the basis of a sentence completion task (although in the comprehension task, the latter group preferred a masculine default strategy, see Liceras et al. 2016, p. 126). However, Spanish–English simultaneous bilinguals in the U.S. demonstrate a preference for the masculine default option in spontaneous speech, irrespective of the gender of the translation equivalent of the English insertion in an otherwise Spanish utterance (see, e.g., Jake et al. 2002; Otheguy and Lapidus 2003). Sequential bilinguals (L1 English–L2 French–L3 Spanish living in Canada) also show a similar pattern with the US simultaneous bilinguals in preferring a masculine default strategy in a semi-spontaneous oral task (Liceras et al. 2016, p. 123). Experimental comprehension tasks also yield mixed results, with, for example, English–Spanish simultaneous bilingual children and L1 Spanish–L2 English sequential bilingual children and adults, and L1 English–L2 Spanish sequential bilingual adults preferring

the analogical criterion. In contrast, simultaneous English–Spanish bilinguals and L1 French–L2 English–L3 Spanish trilingual adults, for example, demonstrated a preference for a masculine default strategy (Liceras et al. 2016, p. 126).

As stated above, the type of structure being tested also appears to play a role in the gender assignment strategy adopted, and can also vary according to the type of bilingual who is using said structure. The two structures involved in gender assignment in nominal constructions are concord and agreement. Concord structures contain a noun and an article that are made to agree with regard to their shared gender features, such as the mixed English–Spanish *la* [theF] *table* [mesaF]. Agreement, on the other hand, refers to constructions where another element in the nominal construction that takes gender marking is also present, namely the adjective in a phrase such as '*the chair* [lasillaF] *es bonita* [is beautifulF]'. Both concord and agreement occur only in languages with grammatical gender, but are still retained in mixed nominal constructions where the noun comes from an ungendered language, such as English or Purepecha. In code-switched Spanish–English constructions, bilinguals generally demonstrate a preference for the analogical criterion in assigning gender to both concord and agreement structures (Liceras et al. 2016, p. 126). However, the results of a sentence completion task with simultaneous English–Spanish bilingual adults suggest that this group instead prefers a masculine default strategy in both structures, although with the tendency being stronger with agreement structures (Valenzuela et al. 2012). These results contrast with those from simultaneous Spanish–English bilingual children, who tend towards using the analogical criterion in both concord and agreement structures, in a similar way to sequential rather than simultaneous bilingual adults (Liceras et al. 2016).

In sum, we can observe variation in gender assignment strategies, with some stronger tendencies emerging in relation to the type of bilingual (simultaneous vs. sequential), task type, and type of structure that affect the strategy adopted. These task-based and structure-based tendencies are important to bear in mind when considering the results of the two studies presented in this paper and is a point we will return to in Section 4 (discussion).

1.4. Objectives and Predictions

Given what we know so far about how bilinguals assign gender in mixed nominal constructions in other language pairs, the goal of the current study is to identify what strategy or strategies Purepecha–Spanish bilinguals use to assign gender to Purepecha nouns in otherwise Spanish speech. On the basis of results from both a production and a comprehension task, and taking into account the structural and phonological features of the two languages, we can formulate three main predictions:

1. Speakers will employ a masculine default (*el*) for all nouns irrespective of their gender in Spanish.
2. Speakers will choose the feminine gender for nouns terminating in *-a* in Purepecha through phonological analogy with Spanish, but masculine gender for all other nouns.
3. Speakers will follow the gender of the Spanish translation equivalent of the Purepecha noun at all times.

We do not expect speakers to use all of the strategies outlined in the predictions necessarily, but previous studies (see Section 1.3) have demonstrated that different results can be obtained based on the type of bilingual and the task type, as well as the structure tested. As such, we could expect to find different strategies used across the two tasks, reflecting variation linked to both task type and structure type. We may also expect to find secondary assignment preferences, also depending on task and structure type (cf. Liceras et al. 2016, p. 126).

The rest of this paper is structured as follows: In Section 2 we present the production and comprehension tasks, their participants and methodology. In Section 3 we present the results of the two tasks. We bring the results of the two tasks together in the discussion in Section 4 and round off the paper with conclusions and directions for further research in Section 5.

2. Materials and Methods

2.1. Production Task

2.1.1. Participants

Eleven Purepecha–Spanish speakers (4 male) participated in the director-matcher production task. All the participants were born and currently live in villages in the Valley of the Eleven Pueblos (known as *Eraxamani* in Purepecha) in Michoacán, namely Carapan, Santo Tomás and Zopoco. They were aged 15 to approximately 45 years of age (mean = 25).[6] The participants are early sequential bilinguals who live in Purepecha-speaking households, but who also use Spanish to certain family members, such as to grandchildren in the case of the older participants. One participant also reported speaking Spanish to her husband. All participants (as Purepecha speakers in the region) attended Spanish-medium primary school, with two hours of scheduled Purepecha language per week, and Spanish-medium secondary school. Four participants attended university, with three of these four having completed the *licenciatura* (bachelor degree) in linguistics at the local *Universidad Indígena Intercultural de Michoacán*, a university aimed at local indigenous young people, which is essentially a Purepecha teacher training course. Five of the seven women do not work, spending most of their time at home as caregivers. The experiment followed the Ethics Code for linguistic research in the faculty of Humanities at Leiden University, which approved its implementation.

2.1.2. Method

The eleven participants completed a forced-switch director-matcher task (also commonly referred to in the literature as the "toy task"; see Gullberg et al. 2009) in their own home, sometimes outside. Efforts were made to use a quiet setting, but this was not always possible. Participants always played the role of the director, sitting at a table opposite the matcher, who was always the same confederate (and also the research assistant). In front of each participant (and confederate) was a grid containing 48 blank squares, with the two grids separated by a card barrier so the participants could not see each other's board. The director's board contained an arrow indicating the direction in which the cards were to be matched.

Each participant was given 48 cards, each containing a line drawing of an object, coloured in either red, yellow or black, or left white. The names of the objects that were used had been normed with native speakers beforehand for phonological ending and known-ness. For example, the picture of a square could not be used since the native speakers reported there being no known Purepecha word for it. The objects used were balanced for gender canonicity in Spanish. There were three items (i.e., nouns) each for four Spanish gender conditions: masculine canonical (ending in *-o*), masculine non-canonical (i.e., not ending in *-o*), feminine canonical (i.e., ending in *-a*), and feminine non-canonical (i.e., not ending in *-a*), totalling 24. Each item was presented in two colours, either yellow (*amarillo*) and red (*rojo*) or white (*blanco*) and black (*negro*), adjectives that all agree for gender in Spanish. There were also three items (i.e., nouns) for the same four gender conditions that varied in terms of size, with one being large (*grande*) and the other being small (*pequeño/chico*), again totally 24 items. The order of the objects was the same for every director.

Instructions were given in a combination of Spanish (by the first author) and Purepecha (by the confederate/research assistant), but not in code-switching mode. Both the first author and the confederate/research assistant were present for all participants. Participants were told that they were playing a game and that the aim was to end with two matching boards. They were requested to complete the task in Spanish, but to name the objects on the cards in Purepecha, as this forced the switch

[6] The age of the oldest participant was not asked for since it seemed inappropriate in the context.

that was required for the speaker to assign gender to an otherwise genderless noun. Target sentences were of the type in (5a–b), where Purepecha words are marked in italics.

5. a. el/la *p'ungwari* rojo/a
ART.DEF.MASC/FEM feather red.MASC/FEM
'The red feather.' (cf. la pluma)

b. el/la *kwini* chico/a
ART.DEF.MASC/FEM bird small.MASC/FEM
'The small bird.' (cf. el pájaro)

The matcher/research assistant helped to ensure switched sentences were produced by asking for clarification when the object was initially not named in Purepecha. Such an approach was necessary particularly since the direction of the switch is a little unnatural for the Purepecha–Spanish bilingual. Switches from Purepecha into Spanish are much more common, as evidenced by the large number of Spanish loanwords in Purepecha, some of which are even integrated into the morphology (see, e.g., Bellamy 2018).

2.2. Comprehension Task

2.2.1. Participants

Twelve Purepecha–Spanish bilinguals (6 female) aged 21:6 years to 37:9 (mean = 27:9 months; SD = 5:1), all residing in Michoacán, and all but one born in the state, participated in the comprehension experiment. While the identity of the online questionnaire participants is not explicitly known, on the basis of the first author's personal knowledge of the individuals, it appears that there is some overlap with the participants in the production experiment (see Section 2.1.1). The main difference between the two groups relates to their level of education rather than language competence. Nonetheless, it is still difficult to make claims regarding differential behaviour on the basis of the two groups not being the same.

Ten participants had at least some university education and two had completed post-graduate studies. In terms of the order of acquisition of the two languages, nine participants (75%) stated that they learned Purepecha before Spanish (the former from age 2), two that they learned the two languages at the same time, and one that they learned Spanish first. Spanish was learned by the majority (75%) from age 6 upwards. This acquisition pattern is mirrored in the maternal input they received (namely the majority received Purepecha input only), although two participants stated that they received paternal input only in Spanish. As such, all participants can be considered early sequential bilinguals. Regarding linguistic input in the education system, one-third of participants reported that Purepecha was the only language in primary school, one-third that their input comprised both Purepecha and Spanish, and the other third that they received only Spanish. In secondary school the picture changes drastically with more than half (58%) of the participants having Spanish input only, four (33%) hearing both languages and only one with solely Purepecha input.

All participants were literate. The average self-report rating for reading in Spanish was 3.83/4 (SD = 0.39), and for reading a little lower at 3.5 (SD = 0.52). In contrast, the average self-report rating for reading in Purepecha was 3.33 (SD = 0.65) and 3.42 (SD = 0.67) for writing. The most common types of texts read in Purepecha were academic texts such as books and grammars (9/12), everyday texts such as newspapers, magazines, letters (10/12) and social networks (for example, Facebook, Twitter and Instagram (9/12)). These were also the most common types of texts written in Purepecha by 10/12 participants for each type. The majority of participants read (7/12) and write (8/12) Purepecha several times a week. Spanish predominates in the workplace, while Purepecha is the more common language in the home and with friends. Purepecha and Spanish are both spoken to the children of the participants.

In terms of code-switching behaviour and attitudes, one-third of participants (4/12) reported using Purepecha and Spanish in the same sentence (at a frequency of several times a week), with two claiming never to do so. Half of the participants agreed with the statement *La gente debería evitar mezclar el purépecha y el castellano en la misma conversación* ('people should avoid mixing Purepecha and Spanish in the same conversation'), while four disagreed.

2.2.2. Method

The comprehension experiment comprised an online two-alternative forced-choice task run in Qualtrics, an online survey tool for the social sciences (see Stadthagen-González et al. 2017, 2018 for more details, including the advantages over traditional Likert scale testing and on the two-alternative forced switch paradigm). Participants were asked to choose between two options for each Spanish sentence with a Purepecha noun, one containing a masculine definite article and one containing a feminine definite article (see (6a–b)). To our knowledge, this is the first experiment of its kind for Purepecha, including Purepecha–Spanish code-switching.

The nouns (n = 40) chosen were equally distributed between masculine and feminine genders in Spanish. Twenty of these nouns have a masculine translation equivalent but terminate in *-a* in Purepecha, as in (6a), whereas the other 20 have a feminine translation equivalent, but terminate in either *-i* or *-u* in Purepecha (6b).

6. a.

El/la	*irecha*	rein-ó	por	25	año-s
ART.DEF.MASC/FEM	king	reign-3SG.PST	for	25	year-PL

'The king reigned for 25 years.' (cf. el rey)

b.

El/la	*kutsari*	se	sent-ía	caliente
ART.DEF.MASC/FEM	sand	3.REFL	feel-3.SG.IMPF	warm

'The sand felt warm.' (cf. la arena)

An example of a stimulus as it appears to the participants in the survey can be observed in (7). The noun *sïkuapu* 'snake' is preceded by the feminine definite article (*la*) in the first sentence and by the masculine counterpart (*el*) in the second (all stimuli can be consulted in Appendix A). The sentence translates as 'the snake can kill you with its venom'. The order of the feminine and masculine counterparts was also randomised.

7. La *sïkuapu* puede matarte con su veneno.
   El *sïkuapu* puede matarte con su veneno.

The order of sentence pairs and options for each sentence pair was randomized for each participant. Eight quality control sentences, which included code-switched sentences containing an incorrect subject-verb agreement in both languages (four in Purepecha, four in Spanish), also formed part of the stimuli and appeared randomly in the survey to test attention and language proficiency. The criterion for exclusion from the study was getting more than two of these quality control questions wrong. No participants were excluded. The experiment followed the Ethics Code for linguistic research in the faculty of Humanities at Leiden University, which approved its implementation.

3. Results

3.1. Production Task

The eleven director-matcher tasks elicited a total of 551 tokens (i.e., nouns), of which 484 display gender agreement on the (Spanish) adjective. Notably, only one example of a Spanish definite article with a Purepecha noun (the intended target sentence type) was recorded, see (8), where the gender used agreed with the gender of the translation equivalent *la luna* 'the moon'.

8. Y abajo despues vamos a poner la nana kutsï[7]
   And below then go.2.PL PREP put.NF ART.DEF.FEM moon
   'And below then we will put the moon.'

The sentence in (8) was followed by the phrase *una blanca grande* 'a big white one' to reinforce the size and colour of the object being named.

There were 362 occurrences of the Purepecha indefinite article *ma*, but it did not trigger a preference for feminine agreement on the adjective(s), even when the Spanish translation equivalent was also feminine (see predictions in Section 1.4), as exemplified in (9a).

9. a. chkur = ma rojo
      leaf = ART.INDEF red.MASC
      'A red leaf.' (cf. una hoja roja)

   b. wiripit = ma negru = ma
      circle = ART.INDEF black.MASC = ART.INDEF
      'A black circle.' (cf. un círculo negro)

Example (9b) also highlights a very common agreement strategy used by participants, namely the use of *ma* as an encliticised indefinite article on both nouns and adjectives, a hitherto unreported use of the term.

There were 484 occurrences of a Purepecha noun with a Spanish adjective, however, meaning that gender agreement could be identified. An overview of the distribution of nouns, in terms of their Spanish translation equivalent, and the adjectival agreement they took is presented in Table 2. Note that the percentage on the left inside the brackets refers to the row, while the percentage on the right refers to the column.

Table 2. Distribution of nouns and their gender agreement.

	Masculine Adjective	Feminine Adjective	Total (Nouns)
Masculine noun (translation equivalent)	294 (99.3%/62%)	2 (0.7%/20%)	296
Feminine noun (translation equivalent)	180 (96%/38%)	8 (4%/80%)	188
Total	474	10	484

Table 2 demonstrates that masculine nouns occur with masculine agreement on the adjective at almost ceiling level and that the combination of a masculine noun with a feminine adjective (i.e., a gender mismatch) was very uncommon. This mismatch can be observed in (10).

10. eskwa roja grandi[8] ma
    eye red.FEM big.FEM ART.INDEF
    'A large red eye.' (cf. un ojo rojo [y] grande)

However, for feminine nouns, the masculine adjective (i.e., a gender mismatch) is preferred, see (11a–b).

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[7] The literal translation of *nana kutsï* is 'mother moon', in opposition to *tata jurhiata* 'father sun', but both refer to the celestial bodies, without any further modification in English.

[8] Note that the Spanish adjective *grande* 'large, big' does not undergo gender agreement, therefore it is glossed as agreeing with the noun it modifies.

11. a. nana kutsï chiqu-ito, blanco
moon small-DIM.MASC white.MASC
'small white moon' (cf. la luna chica, blanca)

b. tsakap = ma negro grande
stone = INDEF.ART black.MASC big.MASC
'A big black stone.' (cf. la piedra negra grande)

In sum, the production task indicates a preference for masculine gender agreement on the adjective (474/484 or 98% of tokens), irrespective of the gender of the translation equivalent. No claims can be made about gender assignment strategies in mixed concord constructions (i.e., Spanish article plus Purepecha noun) since virtually no such structure was offered by the participants.

3.2. Comprehension Task

Participants in the acceptability judgement task had to choose either a masculine or feminine definite article in Spanish to accompany the Purepecha noun in a mixed sentence. For Spanish masculine nouns whose Purepecha translation equivalent ends in *-a*, participants chose the masculine Spanish definite article (*el*) in only 33.33% of the trials (SD = 25.1), meaning the other two-thirds of articles with the masculine translation equivalent were feminine (*la*). We conducted a single sample t-test in order to determine whether this pattern of responses is significantly different from what would be expected from random responses. The choices made by participants were shown to differ significantly from chance by both an items analysis ($t(19) = -3.983$, $p = 0.001$) and a participants' analysis ($t(11) = -2.302$, $p = 0.042$).

For Purepecha, for nouns ending in *-i* or *-u* whose translation equivalent is feminine in Spanish, participants chose the masculine Spanish definite article (*el*) in 73.75% of the trials (SD = 22.9). Once again a single sample t-test showed that this pattern of responses is significantly different from chance, both by items ($t(19) = 7.139$, $p = 0.000$) as well as by participants ($t(11) = 3.597$, $p = 0.004$).

These results indicate that, for Purepecha nouns terminating in *-a* but whose Spanish translation equivalent is masculine, participants tend to rely on the cue provided by orthography in Purepecha: the *-a* ending seems to make them choose the feminine article, while for Purepecha nouns ending in *-i* or *-u*, whose translation equivalent is feminine in Spanish, participants prefer to use the masculine article. In neither set of items is the gender of the translation equivalent strategy adopted. We discuss the different strategies adopted and how they fit in with previously reported results in the next section.

4. Discussion

The most striking result of the two experiments reported in this paper is that the Purepecha–Spanish bilingual participants adopted different gender assignment strategies according to the type of task. In the production task (see Section 3.1), participants overwhelmingly preferred a masculine default strategy, exemplified by the frequent combination of a Purepecha noun whose Spanish translation equivalent is feminine with an adjective displaying masculine agreement. This result supports H1 from our initial predictions (see Section 1.4). It also mirrors the results of other code-switching studies of Spanish–English bilinguals in the USA, where a default masculine gender was preferred in mixed nominal constructions (e.g., Otheguy and Lapidus 2003; Valdés Kroff 2016; see also Valenzuela et al. 2012 for a similar effect in Spanish–English simultaneous bilinguals in Canada). The small to non-existent role of Purepecha phonology on the noun in the choice of assignment strategy is perhaps surprising, especially given the prevalence of *ma* 'a(n), one' suffixed to both Purepecha nouns and Spanish adjectives (cf. Parafita Couto et al. 2015 for Basque-Spanish bilinguals who re-interpret the definite marker *-a* as a marker of feminine gender).

In the comprehension task, participants preferred masculine agreement with Purepecha nouns ending in *-i* or *-u* whose translation equivalent in Spanish is feminine, whereas, for Purepecha nouns ending in *-a* whose Spanish translation equivalent is masculine, the preference was for feminine

agreement. In the latter case, it appears that the phonological cue (here, rendered orthographically) outweighs the masculine default option, which was preferred in the production task. Furthermore, in both cases the actual gender of the translation equivalent seems not to play a role in the strategy adopted. This finding stands in stark contrast with the results of a number of experimental tasks, reviewed in Liceras et al. (2016, p. 126), whereby simultaneous bilingual English–Spanish children, L1 Spanish–L2 English bilingual children and adults, and L1 English–L2 Spanish bilingual adults all display a preference for the analogical criterion when assigning gender in mixed noun phrases.

Yet the results reported in Liceras et al. (2016) highlight another factor that seems to play a role in the strategy used for gender assignment, namely the type of bilingual. In experimental tasks, simultaneous English–Spanish adult bilinguals prefer a masculine default strategy for gender assignment, whereas sequential bilinguals of the L1 English–L2 Spanish type show a tendency for the analogical criterion. However, in spontaneous production the picture is further complicated; adult simultaneous bilinguals in New York City cancel the gender distinction in Spanish, reverting to a masculine default for feminine nouns in the majority of instances. Similarly, spontaneous data from simultaneous English–Spanish bilinguals in Gibraltar also indicate a preference for the masculine default strategy (Moyer 1993, cited in Liceras et al. 2006; see also Liceras et al. 2016, p. 122). The choice of gender assignment strategy, then, seems to be influenced by both the task type (production vs. comprehension) and the order of acquisition of the languages in the pair (i.e., simultaneous vs. sequential), although the relative contribution of each factor is hard to tease apart. In this study all the participants are early sequential bilinguals, having learned both Purepecha and Spanish in early childhood (i.e., before the age of 12; see Montrul 2013). As such, in the comprehension task presented here (Section 2.2), we would expect these participants to favour the analogical criterion for gender assignment, which they do not for either masculine or feminine nouns. They also display no preference for the analogical criterion in the production task, patterning instead with the simultaneous bilinguals in their preference for the masculine default.

The modality of the task may well have played a role in the way gender was assigned in mixed nominal constructions (see also Gómez Carrero 2015). The written mode of the comprehension task may have increased the salience of phonological forms, notably the final *-a* in Purepecha, which triggered a feminine agreement strategy when the Spanish translation equivalents were masculine. Final vowels are less prominent in spoken Purepecha, with word-final *-i* and *-ï* especially reducing to nothing. In the production task, the use of a masculine agreement strategy irrespective of the gender of the Spanish noun may well reflect the notion of "default" as discussed in Bybee (2007, p. 178; following Marcus et al. 1993; Prasada and Pinker 1993), whereby it "is meant to single out the methods of inflection that are used in various 'emergency' circumstances when a plural or other inflected form is unknown". This default form can occur with any word, irrespective of its phonological form and in so doing "uniformly represent an entire class of individuals, suppressing the distinctions among them" (Bybee 2007, p. 178). In the case of gender assignment strategies, the preference for masculine agreement in the production task may reflect a "last resort" strategy of this kind, perhaps encouraged by the more unnatural direction of the switch, namely from Spanish to Purepecha rather than vice versa (see Section 2.2). Alternatively (or additionally), the masculine default strategy may reflect differential representation of the nouns in Purepecha and Spanish. Given that our participant group consisted of mostly early sequential bilinguals, we might expect that they do not store Spanish nouns and articles as chunks (both phonologically and morphologically speaking), but have to assign gender separately in production, where errors may then occur (Carroll 1989, pp. 577–81). This type of separate processing may also account for the lack of articles produced in the production task.

Indeed, the observed norm for the communities tested is to insert Spanish nouns and/or other constituents into otherwise Purepecha speech. That this study focuses on switches in the opposite direction is partly by necessity, since Purepecha has no grammatical gender therefore cannot act as the matrix language to test gender assignment in nominal constructions. Nonetheless, the study shows that clear strategies emerge amongst speakers even when asked to perform a less natural

task, reinforcin its utility regarding our understanding of code-switching constraints. To this end, Fairchild and Hell (2017, p. 160) emphasise that corpus data and experimental online measures do not necessarily align, supporting the need to test 'unnatural' constructions.

5. Conclusions

This initial study into the way Purepecha–Spanish bilinguals assign gender in mixed nominal constructions has demonstrated both a difference in assignment strategies in the type of task being undertaken, as well as the use of two separate strategies in one task (the comprehension task). These differences may be due to the data collection methods employed in the various existing studies, which do not lend themselves to being readily compared. It should be underlined, however, that this is but a preliminary study, necessarily undertaken with a small number of participants. Future research will need to explore the issue of gender assignment from more spontaneous speech, which requires the collection and analysis of a corpus of naturalistic data. This would allow us to identify the natural direction and points of switches, as well as the gender assignment strategies produced spontaneously. Such a dataset would also enable us to identify other code-switched constructions, perhaps including other types of nominal constructions (e.g., including personal and demonstrative pronouns), subject-verb switches and switching within the word, such as the addition of Purepecha plural morphology to Spanish nouns. In any case, more systematic study of this understudied and typologically distant language pair will enrich our current understanding of the possibilities and limits inherent to code-switching, including the extent to which the strategies adopted are language-specific (cf. Poplack et al. 1982).

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Appendix A. Stimuli Used in the Acceptability Judgement Task

Table A1. Trials in *-a* in Purepecha, with a masculine Spanish translation equivalent.

StimID	Item	Spanish Translation
1a	El *sïrijtakua* de color verde me gusta mucho.	vestido
1b	La *sïrijtakua* de color verde me gusta mucho.	vestido
2a	El *japonda* no está tan lejos de aquí.	lago
2b	La *japonda* no está tan lejos de aquí.	lago
3a	El *sïrata* del lumbre hace que me duelan los ojos.	humo
3b	La *sïrata* del lumbre hace que me duelan los ojos.	humo
4a	El *kurucha* se come con papas en Holanda	pescado
4b	La *kurucha* se come con papas en Holanda	pescado
5a	El *terekua* crece en los cerros	hongo
5b	La *terekua* crece en los cerros	hongo
6a	El *eskua* nos permite ver de lejos y de cerca	ojo
6b	La *eskua* nos permite ver de lejos y de cerca	ojo
7a	El *ch'anakua* que mi hermano quiere cuesta mucho	juego
7b	La *ch'anakua* que mi hermano quiere cuesta mucho	juego
8a	El *kustakua* más grande de la banda es la tuba.	instrumento

Table A1. *Cont.*

StimID	Item	Spanish Translation
8b	La *kustakua* más grande de la banda es la tuba.	instrumento
9a	El *terunukua* se llenó de agua mientras caía la tormenta	patio
9b	La *terunukua* se llenó de agua mientras caía la tormenta	patio
10a	El *irecha* reinó por 25 años	rey
10b	La *irecha* reinó por 25 años	rey
11a	El *tirhintikua* de oro brilla mucho	arete
11b	La *tirhintikua* de oro brilla mucho	arete
12a	El *wixujtsïtakua* con dientes grandes peina mejor	peine
12b	La *wixujtsïtakua* con dientes grandes peina mejor	peine
13a	El *tisïmukua* de mi padre le cubre la boca	bigote
13b	La *tisïmukua* de mi padre le cubre la boca	bigote
14a	El *tekarakua* sirve para hacer esculturas	cincel
14b	La *tekarakua* sirve para hacer esculturas	cincel
15a	El *ireta* está cerca de Pátzcuaro	pueblo
15b	La *ireta* está cerca de Pátzcuaro	pueblo
16a	El *kupanda* se come mucho en Michoacán	aguacate
16b	La *kupanda* se come mucho en Michoacán	aguacate
17a	El *eratitarakua* te muestra tu reflejo	espejo
17b	La *eratitarakua* te muestra tu reflejo	espejo
18a	El *jurhiata* sale siempre en el este	sol
18b	La *jurhiata* sale siempre en el este	sol
19a	El *tarhiata* sopla normalmente desde el oeste	viento
19b	La *tarhiata* sopla normalmente desde el oeste	viento
20a	El *piruakua* se vende en muchas tiendas	hielo
20b	La *piruakua* se pone en muchas tiendas	hielo

StimID: stimulus ID.

Table A2. Trials in *-i/-u* in Purepecha with a feminine Spanish translation equivalent.

StimID	Item	Spanish Translation
1a	El *tejki* de la mano crece muy rapido	uña
1b	La *tejki* de la mano crece muy rapido	uña
2a	El *chkari* se recoge en los cerros	madera, leña
2b	La *chkari* se recoge en los cerros	madera, leña
3a	El *kutsari* se sentía caliente	arena
3b	La *kutsari* se sentía caliente	arena
4a	El *tinti* volaba en círculos	mosca
4b	La *tinti* volaba en círculos	mosca
5a	El *phunguari* se utilizaba antiguamente para escribir	pluma
5b	La *phunguari* se utilizaba antiguamente para escribir	pluma
6a	El *urhi* está en el centro de la cara	nariz
6b	La *urhi* está en el centro de la cara	nariz
7a	El *tsïtsïki* azul tiene un olor dulce	flor
7b	La *tsïtsïki* azul tiene un olor dulce	flor
8a	El *akuitsï* verde no puede hacer daño a una persona	serpiente, culebra
8b	La *akuitsï* verde no puede hacer daño a una persona	serpiente, culebra
9a	El *jajki* de un pianista es muy grande	mano
9b	La *jajki* de un pianista es muy grande	mano
10a	El *iurhiri* cubrió su cara después de la batalla	sangre
10b	La *iurhiri* cubrió su cara después de la batalla	sangre
11a	El *sïkuapu* puede matarte con su veneno	araña
11b	La *sïkuapu* puede matarte con su veneno	araña
12a	El *k'uiripu* de Michoacán es muy amable	gente
12b	La *k'uiripu* de Michoacán es muy amable	gente
13a	El *uanapu* vive en la colmena	abeja
13b	La *uanapu* vive en la colmena	abeja

Table A2. *Cont.*

StimID	Item	Spanish Translation
14a	El *tsakapu* se usa para costruir casas	piedra
14b	La *tsakapu* se usa para costruir casas	piedra
15a	El *tsuntsu* contiene mucho atole	olla, jarra
15b	La *tsuntsu* contiene mucho atole	olla, jarra
16a	El *xanharu* cruza todo el pueblo	calle
16b	La *xanharu* cruza todo el pueblo	calle
17a	El *xumu* oculta la cima del cerro	neblina
17b	La *xumu* oculta la cima del cerro	neblina
18a	El *tsurhumu* le pinchó el dedo	espina, púa
18b	La *tsurhumu* le pinchó el dedo	espina, púa
19a	El *k'ut'u* camina muy lento	tortuga; matriz
19b	La *k'ut'u* camina muy lento	tortuga; matriz
20a	El *k'urhu* pasa el invierno en África	codorniz
20b	La *k'urhu* pasa el invierno en África	codorniz

Table A3. Quality control items.

StimID	Item	Spanish Translation
1	**Ima kwara-tsi-x-ka* y se rompió el naso	Él se caió y se rompió el naso
2	**Ji we-ka-p-ti nirani* pero no pude caminar	Yo tuve ganas de ir pero no pude caminar
3	**P'amenchakwa-nkuni jarha-x-p-ti* entonces se fuiste	El estaba enfermo entonces se fue
4	**Nari miti-x-ka* cuando yo llegamos?	Como supiste cuando yo llegué?
5	*El viene *jimpoka t'u yorhi-x-ti.*	Él viene porque tu hablaste
6	*No me viste *porki xarhya-xam-an-ti*	No me viste porque seguiste a nadar
7	*El dije a la gente *ixki pata-ka ya inte chp'irini*	El dijo a la gente que habia apagado el fuego
8	*Cuando yo te vimos, *nira-xa-p-ka-ri kw'inchikwa-rhu*	Cuando te vi, tu estabas andando a la fiesta

* indicates ungrammaticality.

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