

Overt Coordination in Additive Numerals of Minority Languages in South China

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Abstract. This paper explores a typology of overt coordination in additive numerals in a number of minority languages in South China. Among approximately 100 minority languages surveyed, 26 languages feature different coordinators for additive numerals and noun phrases. We show that these two types of coordinators are not semantically, etymologically, or morphologically related. This phenomenon presents a serious challenge to the proposal that additive numerals do not form constituents and that numeral coordination is derived from underlying nominal coordination in such languages.

1. Introduction

Since Hurford's (1975, 1987) pioneering studies of the linguistic theory of numerals, the standard syntactic analysis assumed that complex numerals such as *five hundred* (multiplicative) and *fifty-two* (additive) were phrasal constituents (Corver & Zwarts 2006, among others), until it was challenged by Ionin & Matushansky (2006; hereafter, I&M), who proposed a nonconstituency analysis for complex numerals. I&M assumed that numerals such as *two*, *hundred*, and *thousand* are predicate modifiers of type $\langle\langle\text{et}\rangle\langle\text{et}\rangle\rangle$ selecting lexical nouns or other base-noun combinations as complements. A multiplicative numeral expression such as *one hundred languages* thus projects a complementative structure as bracketed in [one [hundred [languages]]]. Consequently, an additive numeral expression such as *one hundred and two languages* is derived from a full NP coordination in which the head noun is either right-node-raised or PF-deleted, as illustrated in [[one hundred t_i] and [two t_i] languages;] or [[one hundred languages] and [two languages]]. I&M argued that the complementative analysis for numerals receives empirical support from the Case-marking data from Russian.

We are grateful to Klaus Abels and three anonymous *Syntax* reviewers for valuable and constructive comments. We thank our native informants of various languages: Migmar Tesring, Tesring Norbu, Yeshe Trom, Kado, Tesring Nyima, Kelsang Putri, and Tashi Trok (Tibetan); Shi Xingquan, Ma Guangzhong, Ma Yuanqing, and Long Zezhi (Miao); Yu Yingxiang, An Dan, Yu Ying, Pa Tuanshi, and Feng Xiaohuan (Dai); Lei Chunping and Lei Cailan (Achang); Shi Chenling, Sha Baomai, and Zhang Bosan (Jingpo); Pai Xiaolong, Shang Youwang, and Zhao Lashan (Zaiwa); Siki Paylan, also known as Shihan Lin (Amis); Tang Yuan-Feng (Atayal); and Mo'o Peongsi, also known as Hsin-Shi Wang (Tsou). For Austronesian languages, Prof. Hui-Chuan Huang, Prof. Rik de Busser, Prof. Elizabeth Zeitoun and Prof. Yung-Li Chang also provided us valuable data and confirmation. Their generosity, patience, and cooperation are gratefully acknowledged. All remaining errors in the paper are our own. Part of this paper was presented at LingGroup, an internal regular seminar for linguistics faculty and research students at Hunan University. C.-S. He's work is financially supported by 16BYY181 "Studies on the Syntax-Semantics Interface of Numerals of Languages within China" granted by the China National Social Science Foundation. Her's work is financially supported by MOST-104-2410-H-004-164-MY3 "A Typological Study of Numeral Bases and Numeral Classifiers in Indo-European and other European Languages", MOST-103-2410-H-004-136-MY3 "The Cognitive Mechanism and Neural Correlates Underlying the Convergence and Divergence of Chinese Numeral Classifiers and Measure Words," and MOST-104-2633-H-004-001 "The Single Origin Hypothesis for the World's Numeral Classifier Languages."

Although highly influential, this proposal has met some challenges in both its semantics and syntax. I&M's semantic assumption is challenged in Rothstein 2013 and He 2015b.¹ Their syntactic analysis (a consequence of semantics) is challenged in Kayne 2010 and more recently in Meinunger 2015 and He 2015a. Meinunger presented several syntactic, semantic, and pragmatic arguments against the nonconstituency analysis and proposed a graft (constituent) structure for complex numerals, which can deal with the Russian Case data equally well. On the basis of Mandarin data, He put forward a series of syntactic, semantic, and morphophonological arguments against the nonconstituency analysis and proposed a more traditional Hurfordian structure for complex numerals. He also investigated a small number of minority languages in South China and found that these minority languages feature morphophonological processes similar to those found in Mandarin Chinese, and his findings also support a constituency analysis for complex numerals in these languages.

Considering that many languages use overt coordinators to link numerals—for example, English *and* and French *et*—and that many languages, such as Chinese (see sect. 3.1), use different coordinators to link different syntactic categories, we speculate that there may be languages that use different coordinators for linking numerals and linking nouns. If we can prove that such different coordinators are indeed different morphemes, and thus not allomorphs of the same morpheme, we will have strong reason to believe that numeral phrases cannot be derived from nominal phrases.

With this logic in mind and inspired by He's initial investigation of minority languages in South China, we conducted an extensive survey of more than 100 minority languages in the region, first based on documented resources,² covering five language families or groups: Tibeto-Burman, Austroasiatic, Austronesian, Tai-Kadai, and Miao-Yao. The results of this extensive literature survey show that 26 languages feature different coordinators for numerals and for nominals, which stand in strict complementary distribution and thus cannot be used interchangeably. Then we did field work. Of these 26 languages, we consulted with native speakers and experts in 11 languages and obtained firsthand verification of core data, which are critical to our

¹ The <<et><et>> semantics requires that any cardinal must first be satisfied with a lexical NP argument and that the lexical NP should be a singular one denoting a set of atoms, although superficially it may appear in the plural form. I&M attribute this singularity requirement to a pragmatic constraint: "only individuals of the same (known) cardinality can be counted" (p. 329). In a recent survey paper on the syntax–semantics interface of numerals, He (2015b) points out several problems with I&M's semantics. One concerns the pragmatic constraint. It seems wrong to assume that counting can only be possible when the objects to be counted must have the same cardinality. This is shown in (i), which directly tells us that the individuals have different cardinalities. If the constraint really works, (i) should be an inappropriate form. And in (ii), we can clearly count the sets as two, even though they have different cardinalities.

- (i) two sets of atoms of different numbers
- (ii) A is the set of all natural numbers and B is the set of all real numbers. These two sets have different cardinalities, according to Cantor.

² Sources included 57 books in the *Series of Grammar Sketches of Minority Languages in China*; 50 books in the *Series of Newly Discovered Languages in China*; *Zhongguo de Yuyan* (The Languages of China), an encyclopedic reference grammar book of 129 minority languages in China; and other relevant literature.

argumentation and are not provided in the documented resources. Among the 11 verified languages, a thorough investigation of Tibetan was made thanks to the large number of Tibetan students in Hunan University.³ Our purpose is to draw attention to a set of languages spoken in South China that I&M's structural analysis cannot account for and thus their proposal cannot be universally correct.

This article is organized as follows. Section 2 reports the data of different coordinators for nominals and for numerals in 26 languages. On the basis of these data, section 3 argues against the proposal that numeral coordination is derived from underlying nominal coordination, and it refutes an alternative solution that treats the numeral coordinators and the nominal coordinators as allomorphs of a single morpheme. Section 4 rejects another alternative solution (for some of these languages) that treats numeral coordinators as numerals similar to the Chinese *ling* 'zero'. Section 5 provides a sketch of the syntax and semantics of numeral coordination and outlines a typology of numeral coordination. Section 6 is the conclusion.

2. The Data

2.1. Tibeto-Burman Languages

In Tibetan (mainly spoken in Tibet, Qinghai, and Sichuan with a population of five million, [figure estimated by the end of 2000]; see Sun, Hu & Huang 2007 for this and the other languages we discuss), noun phrases are conjoined by *ta* or *daŋ* (used in different Tibetan dialects but interchangeable among these dialects, *daŋ* is more frequently used in written Tibetan).

- (1) meto² mapo **ta/daŋ** loma teaŋkhu Sun, Hu & Huang (2007:172)
 flower red CONJ leaf green
 'red flowers and green leaves'

The picture for numerals is different. Additive numerals between 10 and 20 are formed by juxtaposition of teens and digits (coordinators are not allowed). Usually there are phonological processes taking place between *ten* and the digits.

- (2) a. mi teu² tei² b. mi teø: ŋa c. mi teu:r ku
 person ten one person ten five person ten nine
 '11 people' '15 people' '19 people'

³ We did not obtain verification for the other 15 owing to practical difficulties, such as the small size of the populations and the remoteness of the areas where these languages are spoken. Nonetheless, we believe that the verified observations are sufficiently sound and general for our purpose. Although the verification of the other 15 languages would add more data to our observation, it would not strengthen the force of our argument in any qualitative aspect, and, by the same token, a failure to verify them would not significantly weaken the force of our argument.

Numerals above 20 and under 100 use different coordinators: *tsak* for 20, *so* for 30, *ɛɛ* for 40, *ŋa* for 50, *re* for 60, *t̃y* for 70, *ca* for 80, and *go* for 90 (Zhou 1998). The following data are based on the Lhasa dialect.

- | | |
|---|---|
| (3) a. mi ŋi tɕu tsak tɕi ²
person two ten CONJ one
‘21 people’ | b. mi sum tɕu so ŋa
person three ten CONJ five
‘35 people’ |
| c. mi ɕip tɕu ɛɛ tɕi ²
person four ten CONJ one
‘41 people’ | d. mi ŋa tɕu ŋa ŋi
person five ten CONJ two
‘52 people’ |
| e. mi tɕʰuk tɕu re tɕi ²
person six ten CONJ one
‘61 people’ | f. mi t̃y tɕu t̃y tɕi ²
person seven ten CONJ one
‘71 people’ |
| g. mi ɕɛ ² tɕu ca ku
person eight ten CONJ nine
‘89 people’ | h. mi ku tɕu go ku
person nine ten CONJ nine
‘99 people’ |

This pattern is the same across all Tibetan dialects, including U-Tsang (Lhasa), Amdo, and Khams. It is easily observable that the numeral coordinators are morphologically related to the multiplier numerals, except for 20 and 60. According to Zhou (1998:55–56), these numeral coordinators are derived from the multiplier numerals by certain phonological harmony rules (mostly having to do with the same consonants, with ablaut in the vowels). The numeral coordinator *tsak* (*rtsa* in written Tibetan) is etymologically derived from *brtsegs* ‘add’, which was used to conjoin numerals in ancient Tibetan (before the eighth and ninth century). The numeral coordinators *so*, *ɛɛ*, *ŋa*, *re*, *t̃y*, *ca*, and *go* are later developments.

The numeral coordinators in (3) can occur without a preceding numeral, as shown in (4) (mainly occurring in spoken Tibetan, less frequent in written Tibetan), which fully indicates that these numeral coordinators are numerals in origin. The relevant morphemes are still coordinators, not numerals themselves. Except for *ŋa* and *t̃y*, which happen to be of the same phonetic forms as *ŋa* ‘five’ and *t̃y* ‘seven’, all the others are phonetically different from, although clearly related to, their relevant numerals—for example, *solsum*, *ɕipleɛ*, *tɕʰuk/re*, *ɕɛ²/ca*, *kulgo* (see Zhou 1998:56–57 for an explanation of *tɕʰuk/re*). Thus, the preceding teens, when omitted, can be easily deduced from the relevant numeral coordinators.

- | | |
|--|---|
| (4) a. mi tsak tɕi ²
person CONJ one
‘21 people’ | b. mi so ŋa
person CONJ five
‘35 people’ |
|--|---|

For numerals above 100, however, the coordinator conjoining hundreds and teens is the nominal coordinator *ta* or *day*. So, in a numeral expression over 100, there may be two different coordinators, as shown in (5). Baima, a close relative of Tibetan, is similar in this regard (see table 1).

Table 1. Nominal coordinators and numeral coordinators in nine other Tibeto-Burman languages

Language	Nominal coordination	Numeral coordination	Source
Achang	səh zu ⁷ lo⁷ sum zu ⁷ two CLF CONJ three CLF 'two people and three people'	ta pak mə ta sau one hundred CONJ one twenty '120'	Dai & Cui 1985:36, 62
Anuŋ (Anong)	ahŋ sɿ asuŋ bowl CONJ chopstick 'bowls and chopsticks'	phā ea i kuŋ tshai aŋi five hundred CONJ six ten-CONJ two '562'	Sun & Liu 2005:70–71, 117
Baima	kama re dzafe star CONJ moon 'stars and the moon'	ŋa dza re ŋi fo tsa ŋi five hundred CONJ two ten CONJ two '522'	Sun, Qi & Liu 2007:63, 124
Jingpo	jāta the⁷ jākan moon CONJ star 'moon and stars'	khjiŋ māŋa e tǣkhu tsa thousand five CONJ nine hundred '5,900'	Liu 1984:48, 60
Nusu	liabiasu le lamomsu farmers CONJ workers 'farmers and workers'	thi cha i ŋa ^a one hundred CONJ five '105'	Sun & Liu 1986:38, 94
Pynru (Bengru) ^b	anai apu gəyai rəu mother father child CONJ 'mother, father, and children'	lyŋ galie rŋŋ waŋ galie akhy hundred CONJ ten PARTICLE CONJ one '111'	Sun, Hu & Huang 2007:712, 719
Suloŋ (Sulong)	ahai da adziaŋ adults CONJ children 'adults and children'	sua na çun ten CONJ one '11'	Li 2004:64, 67
Xiandao	tʂu nyk xo chopsticks CONJ bowls 'chopsticks and bowls'	ta pak mua sum tshi mua ta one hundred CONJ three ten CONJ one '131'	Dai et al. 2005:38, 82
Zaiwa	tsaŋ lă khə ² ə² tshun lă khə ² rice one bowl CONJ meat one bowl 'one bowl of rice and one bowl of meat'	sum fo kəm ʃit three hundred CONJ eight '308'	Zhu 2011:62, 227

^aIn Nusu, the numeral coordinator *i* is used to link missing powers but does not appear between adjacent powers. The same is true for Zaiwa (*kəm*) (see sect. 4 for more discussion).

(i) a. v.i cha sɔ tshe ŋa Nusu b. lă tshə lă Zaiwa
four hundred three ten five one ten one
'435' '11'

^bThe numeral coordinator *galie* in Pynru is a verb meaning 'exceed'. It is noteworthy that in Pynru the nominal coordinator *rəu* is adjoined to the right of the last conjunct, but the numeral coordinator *galie* occurs between numerals.

(5) mi ca **daŋ** ŋi eu **tsak** cə²
person hundred CONJ two ten CONJ eight
'128 people'

When there is a missing power between two numerals, Tibetan uses a special method by inserting *teu me²* ('ten no')⁴ between the two numerals, indicating that the teens are missing, as in (6a). Where there are two missing powers, there are two

⁴ *Me²* is the negated existential verb in Tibetan, with the literal meaning of 'not-have' (the existential verb is *jə* 'have'), for example:

(i) Q. Cherā la ŋy jə pə?
you money have PARTICLE
'Do you have money?'
A: Mə².
not-have
'No.'

occurrences of the $m\epsilon^?$ -structure, indicating that both the hundreds and the teens are missing, as in (6b).

- (6) a. mi sum ca **teu $m\epsilon^?$** tʂ'uk
 person three hundred **ten not-have** six
 '306 people'
- b. mi sum toŋ **ca** **$m\epsilon^?$** **teu $m\epsilon^?$** tʂ'uk
 person three thousand **hundred not-have ten not-have** six
 '3,006 people'

In Tibetan, *tsak*, *so*, *ee*, *ŋa*, *re*, *t̃y*, *ca*, and *go* are exclusively used for conjoining numerals and do not seem to have any other functions. They can be called “exclusive numeral coordinators.” Among the 45 Tibeto-Burman languages surveyed, we found nine other languages (in addition to Tibetan) that feature different coordinators for numerals and for nominals, as shown in table 1. All the languages feature an exclusive numeral coordinator.

2.2. Tai-Kadai Languages and Miao-Yao Languages

Among the Tai-Kadai languages—including Dai, Zhuang, Kam, Buyi, Shui, Maonan, Mo, Lakkja, Mulao, and T'en—only Dai (spoken in Yunnan with a population of approximately one million) has different coordinators for nominals and for numerals. Among the Miao-Yao languages—such as Miao, Yao, Mjen, Bunu, and She—only Miao (mainly spoken in Hunan and Guizhou with a population of approximately eight million) has different coordinators for nominals and for numerals (see table 2).

In both Dai and Miao, the numeral coordinators are used to conjoin nonadjacent powers only, not adjacent powers. It is noteworthy that the numeral coordinator *pa:i* in Dai means ‘more’ and can appear in other environments as well, as shown in (7) (see sect. 3.2 and sect. 4 for the importance of this fact in relation to our argumentation).

- (7) a. sip **pa:i**
 ten **more**
 ‘a little more than ten’
- b. mi tset sip kun **pa:i**.
 have seven ten person **more**
 ‘There are a little more than 70 people.’

Table 2. Nominal coordinators and numeral coordinators in Dai and Miao

Language	Nominal coordination	Nominal coordination	Nominal coordination	Source
Dai	phak le man vegetable CONJ oil ‘vegetables and cooking oil’	a. hok pan pa:i sa:u six thousand CONJ twenty ‘6,020’	b. sip et ten one ‘11’	Yu & Luo 1980:41, 66
Miao ^a	pji qwa kə pji zə fruit peach CONJ fruit pear ‘peaches and pears’	a. u tshə qa zi two thousand CONJ eight ‘2,008’	b. a ku pzei one ten four ‘14’	Xiang 1999:49, 53, 82

^aMiao, with its three major dialects, is an important language in the region. The data here are based on the Hunan West dialect (the Xiangxi dialect) that is spoken in Huayuan County (Jiwei Township) and Baojing County in the west of Hunan Province.

2.3. Austroasiatic Languages and Austronesian Languages

Many of the Austroasiatic languages spoken in Yunnan province of southwest China are heavily influenced by Dai, a Tai-Kadai language that is more dominant in the region, and use the borrowed morpheme *pa:i* from Dai (in slightly different phonetic forms) to conjoin numerals, while using native coordinators for nominals (see table 3).

Among the ten Austronesian languages spoken in Taiwan that we surveyed, only Rukai has the same form *la* to conjoin numerals, nouns, and verbs. The other nine all feature different coordinators for numerals and for nouns (see table 4).

Except for Atayal, all the Austronesian languages discussed so far use verbs to conjoin numerals. Examples include *ira* ‘have’ and *ti[ɨ]afaw* ‘remain’ in Amis, *(tu)han* ‘(again) count’ in Bunun, *yau* ‘have’ in Kavalan, *sa²a* ‘remain’ in Paiwan, *miasma* ‘remain’ in Puyuma, *izaw* ‘exist, have’ in Sakizaya, *ianan* ‘exist, have’ in Thao, and *veia* ‘return (to take something)’ in Tsou.⁵ They have main predicate uses, as shown below.

Table 3. Nominal coordinators and numeral coordinators in five Austroasiatic languages

Language	Nominal coordination	Numeral coordination		Source
		Adjacent numerals	Nonadjacent numerals	
Blang (Bulang)	pap kap pi ² book CONJ pen ‘books and pens’	sip et ten one ‘11’	soŋ hoi pai phuan two hundred CONJ five ‘205’	Li, Nie & Qiu 1986:36, 46
Kəmu ² (Kemu)	be ² pə² trak sheep CONJ cow ‘sheep and cows’	sip et ten one ‘11’	soŋ roi blai ha three hundred CONJ five ‘305’	Chen 2002:161, 178
Khymet (Kemie)	moi hai pāŋ cow CONJ horse ‘cows and horses’	sam sip et three ten one ‘31’	sam ɣoi ² pai kau three hundred CONJ nine ‘309’	Chen 2005:88, 112
Pueij (Buxing)	ʔua pə² tuāih monkey CONJ locust ‘monkeys and locusts’	ʔep soŋ ten two ‘12’	rai pai nəŋ hundred CONJ one ‘101’	Gao 2004:99, 105
Ta ² aŋ (De’ang)	tau ka:i jəŋ vegetable CONJ meat ‘vegetables and meat’	ʔu ky:r lu ʔu one ten CONJ one ‘11’	(i) ʔu jah loi ʔu one hundred CONJ one ‘101’ (ii) ʔu həŋ pa:i ʔu one thousand CONJ one ‘1001’	Chen, Wang & Lai 1986:46, 65, 73

⁵ Several Austronesian languages use the existential verb to conjoin numerals; this is reminiscent of Archaic Chinese in which numerals are obligatorily conjoined by *you* ‘have’ (or *you* ‘again’). During the Spring and Autumn and the Warring Period (770–221 B.C.E.), this rule was relaxed, and the existential verb is no longer used in the spoken language (Wang 1957:256–257). However, the use of *you* within numerals can still be seen today in numerals expressing age with a sense of archaicity (He 2015a:192).

(i) 肇 十 有 二 州, 封 十 有 二 山。 《尚书》
Zhou shi you er zhou Feng shi you er shan Shangshu
Zhou ten have two prefecture, Feng ten have two mountain Shangshu
‘Zhou has 12 prefectures, and Feng has 12 mountains. (Shangshu)’

The existential verb *ianan* in Thao is optional in numerals such as 11, which probably indicates that the rule is also weakening as happened in Archaic Chinese (*ianan* is not reported in the Council of Indigenous Peoples 2014).

Table 4. Nominal coordinators and numeral coordinators in nine Austronesian languages

Language	Nominal coordination	Nominal coordination	Numeral coordination	Source
Amis	(i) k-u futing atu hmay NOM-CLASS fish CONJ rice 'The fish and rice' (ii) ci aki-an aci panay-an CLASS Aki-DAT CONJ Panay-DAT 'Aki and Panay'	a tosa polo' ira ko PARTICLE twenty CONJ ART ceccay ^a one '21'		Wu 2000, Council of Indigenous Peoples (CIP) 2014
Atayal	caxa' ku qumisuwan ru one NOM older-sibling CONJ caxa' ku suwayi' mu na kanayril one NOM younger-sister 'an older sister and a younger sister'	magalpuw cu qutux ten CONJ one '11'		Huang 2000, CIP 2014
Bunun	Bunun mas asu hai, masial tu person CONJ dog TOP good ATTR kaviaz. friend 'People and dogs are good friends.'	mapus-an han tasa ^b twenty CONJ one '21'		Zeitoun 2000, He, Zeng, Li & Lin 1986:98, 101, CIP 2014
Kavalan	sunis tu baqian child CONJ old man 'children and old men'	Rabetin yau usiq ten CONJ one '11'		Chang 2000, CIP 2014
Paiwan	Min[layal]ayap a t[aynan] ² a ta PROG.fly ART bee CONJ ART t[ut]u. butterfly 'Bees and butterflies are flying.'	tapu[luq] sa ² a ita ten CONJ one '11'		Chen & Ma 1986:56, 73
Puyuma	[atu] giŋŋin aw asiru mango longan CONJ orange 'mangos, longans, and oranges'	makapat miasma ɖa luata forty CONJ PARTICLE five '45'		Sun, Hu & Huang 2007:2321, 2319
Sakizaya	Dungi aci Maya Dungi CONJ Maya 'Dungi and Maya'	tusa a bataan izaw ku two PARTICLE ten CONJ PARTICLE cacay one '21'		CIP 2014
Thao	naak a ripnu numa taun my LINKER rice-paddy CONJ house 'my rice paddy and house'	makthin ianan tata ten CONJ one '11'		Sun, Hu & Huang 2007:2227, CIP 2014
Tsou	o- puutu ho tsou NOM-Chinese CONJ Tsou 'Chinese people and Tsou people'	masku- veia ucni ten CONJ one '11'		Sun, Hu & Huang 2007:2254, 2260, CIP 2014

^aHe, Zeng, Tian & Lin (1986:56) report another coordinator for numerals in Amis: *tʃiʃafaw*, which is also a verb 'remain', as in (i). They also report a less commonly used method to form additive numerals in this language: the numbers 11 and 999 can be expressed as (ii), which is called overcounting (Menninger 1969, Hurford 1975:235–239, Meinunger 2015).

(i) a. tuʃa a puluʔ tʃiʃafaw tu tuʃa
two PARTICLE ten CONJ PARTICLE two
'22'

(ii) a. tʃəʔaj (ku) ʃakatuʃa b. ʃiwa a ʃuʔut ʃiwa ʃakamuətəp
one PARTICLE second nine PARTICLE hundred nine tenth
'second one = 11' 'nine hundred and tenth nine = 999'

^bIn He, Zeng, Li & Lin 1986:61, the numeral coordinator is *tuhan*, which is described as a fused form of *tu han* 'again count'.

- (8) a. Itia hu **ira** ka mat[ahiaj a luma[?]. Amis
 that-time still **have** that poor PARTICLE family
 'There was a poor family once.'
- b. **Yau** uzusa lazum na tune^k. Kavalan
have two hand ART clock
 'A clock has two hands.'
- c. Os-'o **yuovei-a** 'o macucuma. Tsou
 TR.REALIS-1SG.ERG **return-TR** ABS something
 'I returned to take something.'

3. Morphemes or Allomorphs?

Table 5 summarizes the major findings reported in the previous section. All the languages in table 5 use different coordinators for nominals and for numerals (some also use different coordinators for other categories, e.g., adjectives and verbs). It is important to note that the numeral coordinators in some of these languages are etymologically related to verbs or adjectives and may have other uses, although the etymology of the numeral coordinators in the other languages is unclear, owing to insufficient description in the cited publications.

3.1. Tibetan

In this subsection, we focus on Tibetan. Under I&M's proposal, (9a) is derived from (9b), which is, however, ungrammatical. The nominal coordinator must be either *ta* or *daŋ*, as in (9c). The same is true for other examples in (3). All the Tibetan data in this article have been confirmed firsthand by our Tibetan informants.

- (9) a. mi sum teu **so** ŋa
 person three ten CONJ five
 '35 people'
- b. *mi sum teu **so** mi ŋa
 person three ten CONJ person five
 Intended: '30 people and 5 people'
- c. mi sum teu **ta/daŋ** mi ŋa
 person three ten CONJ person five
 '30 people and 5 people'

This fact poses serious difficulty to the proposal that surface numeral coordination has an underlying nominal coordination structure, because a grammatical form cannot be derived from an ungrammatical base form. However, one may defend I&M's proposal and treat the various numeral coordinators and nominal coordinators as allomorphs of a single morpheme. In other words, complex

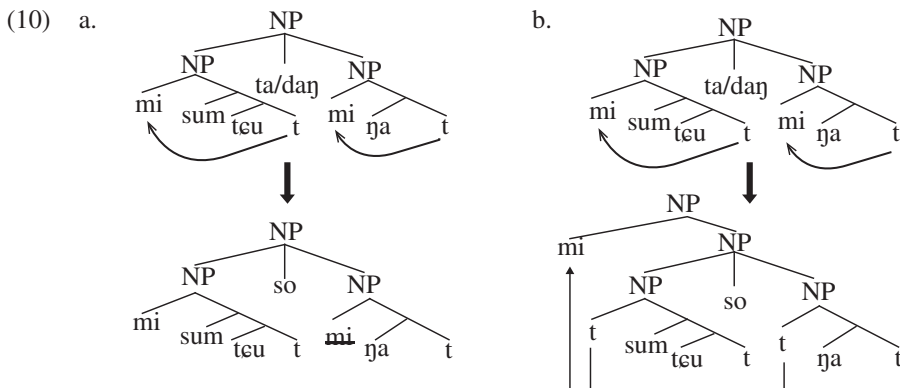
Table 5. Summary of major findings

Language type and languages	Nominal coordinator	Numeral coordinator	Etymology for numeral coordinator
Tibeto-Burman			
Achang	<i>lɔʔ</i>	<i>mɔ</i>	Unclear
Anun	<i>sɿ</i>	<i>i</i>	Unclear
Baima	<i>re</i>	<i>tsa, re</i>	<i>tsa</i> is borrowed from the Tibetan <i>tsak</i> ‘add’
Jingpo	<i>theʔ</i>	<i>e</i>	Unclear
Nusu	<i>le</i>	<i>i</i>	Unclear
Pynru	<i>rəu</i>	<i>galie</i>	<i>galie</i> , a verb meaning ‘exceed’
Sulon	<i>da</i>	<i>na</i>	Unclear
Tibetan	<i>ta</i> or <i>dan</i>	<i>tsak, so, ee, ŋa, re, t̃y, ca, and ko</i>	<i>tsak</i> (<i>rtsa</i> in written Tibetan) is etymologically from <i>brtsegs</i> , meaning ‘add’; the others are associated with multiplier numerals of the teens
Xiandao	<i>nyk</i>	<i>maʔ</i> or <i>mua</i>	Unclear
Zaiwa	<i>əʔ</i>	<i>kəm</i>	<i>kəm</i> , an adjective meaning ‘empty’ (probably borrowed from Chinese <i>kong</i> ‘empty’)
Tai-Kadai			
Dai	<i>le (taŋ)</i>	<i>pa:i</i>	<i>pa:i</i> , an adjective meaning ‘more’
Miao-Yao			
Miao	<i>kɔ</i>	<i>qa</i>	Unclear
Austroasiatic			
Blang	<i>kap</i>	<i>pai</i>	<i>pai</i> , borrowed from Dai, an adjective meaning ‘more’
Kəmuʔ	<i>pɔʔ</i>	<i>blai</i>	<i>blai</i> , borrowed from Dai, an adjective meaning ‘more’
Khymet	<i>hai</i>	<i>pai</i>	<i>pai</i> , borrowed from Dai, an adjective meaning ‘more’
Pucij	<i>pɔʔ</i>	<i>pai</i>	<i>pai</i> , borrowed from Dai, an adjective meaning ‘more’
Taʔaŋ	<i>ka:i</i>	<i>lu, loi, pa:i</i>	<i>loi, pa:i</i> , adjectives meaning ‘more’
Austronesian			
Amis	<i>aci, atu</i>	<i>ira, t̃iʔafaw</i>	<i>ira</i> , a verb meaning ‘have’; <i>t̃iʔafaw</i> , a verb meaning ‘remain’
Atayal	<i>ruʔ</i>	<i>cu</i>	Unclear
Bunun	<i>maʃ</i>	<i>(tu)han</i>	<i>tu han</i> , a verb meaning ‘again count’
Kavalan	<i>ta</i>	<i>yau</i>	<i>yau</i> , a verb meaning ‘exist, have’
Paiwan	<i>ʔa</i>	<i>saʔa</i>	<i>saʔa</i> , a verb meaning ‘remain’
Puyuma	<i>aw</i>	<i>miasma</i>	<i>miasma</i> , a verb meaning ‘remain’
Sakizaya	<i>aci</i>	<i>izaw</i>	<i>izaw</i> , a verb meaning ‘exist, have’
Thao	<i>numa</i>	<i>ianan</i>	<i>ianan</i> , a verb meaning ‘exist, have’
Tsou	<i>ho</i>	<i>-veia</i>	<i>-veia</i> , from a verb <i>yuoveia</i> meaning ‘return (to take something)’

numerals have the syntactic structure outlined in I&M, the default morphological form of coordination is the one that appears with overt nominal coordination, but coordination takes on other morphological forms (i.e., phonological spell-out) in the

context of certain types of deletion/movement and relative to the numerals being coordinated.⁶

Note first that under I&M's semantics numerical bases are $\langle\langle et \rangle\rangle$ type, requiring NP complements as their $\langle et \rangle$ arguments, as shown in [one [hundred [languages]]]. However, in Tibetan, the surface order of numeral expressions is head nouns + numerals. Therefore, a Tibetan multiplicative numeral expression *mi sum teu* 'people three ten' should have an underlying form of *sum teu mi*. The noun *mi* 'people' should be base-generated as the complement of the numerical base *teu* 'ten' and raise to the prenumeral position, leaving a trace *t* behind, as shown in the top trees in (10a) and (10b). Therefore, in deriving (9a) from (9c), the noun *mi* should first undergo syntactic operations followed by the morphological change of *ta/dan* to *so*, as shown in (10a) for the deletion approach and (10b) for the raising approach. It seems that the reason triggering the morphological change of *ta/dan* to *so* is that *ta/dan* are preceded and followed by an empty trace.⁷



Such an account is problematic from various grammatical perspectives: morphological, etymological, syntactic, and semantic. First, in morphology, allomorphs are usually bound to a root and are phonetically similar—for example, *impossible*, *incorrect*, *irregular*, and *illegal*. In the Tibetan case, *so* and the other numeral coordinators are phonetically dissimilar from the nominal coordinator *ta/dan* and, as far as we know, an allomorph attaching in between two empty traces is not attested. Furthermore, such an account cannot explain why there are so many different allomorphs of *ta/dan* appearing in exactly the same environment—that is, between

⁶ A reviewer reminds us that this type of allomorphic analysis is commonplace in Generative Semantics, in which certain phonological forms can appear only after movement and deletion operations (e.g., “kill” can only appear as a replacement for “cause to die” after the object of “die” is deleted and/or moved out of the complex verb phrase). However, we note that the days when these types of Generative Semantics accounts allowing “kill” to be derived from “cause-to-die” in syntax were used within the field have long passed. Such accounts are too powerful to be entertained in the current generative syntactic theory.

⁷ In Tibetan (and many other languages), modifiers including numerals and adjectives uniformly follow head nouns (see (1) for noun+adjective structures; Sun, Hu & Huang 2007:172). A reviewer correctly points out that if the order is [Num N], then the coordinator does not precede a trace, as shown in [Num ~~N~~ and Num N] or [[Num *t_i* and Num *t_j*] N_j]. In this case, the coordinator follows a trace.

two empty traces. The only solution is to stipulate a different ad hoc morphophonological rule for each and every phonological form—that is, *tsak*, *so*, *ee*, *ŋa*, *re*, *t̃y*, *ca*, and *go*. Such stipulations must access the internal structure of the preceding NumP conjunct and be able to “see” the value of the multiplier as well as the value of its complement, that is, the 10^1 base. However, this would require extraordinary context-sensitive power, which thus renders such treatment unfeasible.

Second, the Tibetan numeral coordinators and nominal coordinators differ etymologically, indicating that they are also different semantically. According to Zhou (1998:55–56), whereas *tsak* is derived etymologically from *brtsegs* ‘add’, the other numeral coordinators are derived from their multiplier numerals by certain phonological harmony rules, and these numeral coordinators can occur without preceding numerals, fully indicating that such numeral coordinators are numerals in origin, not allomorphs of the nominal coordinators.

Third, in Tibetan, the numeral coordinator conjoining hundreds and teens is the same one as the nominal coordinator, but the numeral coordinators conjoining teens (above 20) and digits are the special ones as discussed previously. Example (11a) is supposedly derived from (11b) by means of deletion or raising, as shown in (12a) and (12b), respectively. Both instances of *ta/day* in the two derivations are in the same syntactic environment—that is, immediately preceded and followed by an empty trace. It is a mystery as to why *ta/day* is realized as *tsak* and other allomorphs between teens and digits but unchanged between hundreds and teens, although they occur in exactly the same syntactic environment. If we treat complex numerals as constituents, the use of the nominal coordinator in larger Tibetan numerals can be explained by accounts which assume that *hundred/thousand* are of a different type from other smaller numerals, and more “nominal.” See, for example, Rothstein 2013.

- (11) a. *mi ca ta/day ŋi eu tsak ceʔ*
 person hundred CONJ two ten CONJ eight
 ‘128 people’
 b. *mi ca ta/day mi ŋi eu ta/day mi ceʔ*
 person hundred CONJ person two ten CONJ person eight
 ‘100 people and 20 people and 8 people’
- (12) a. *mi ca t ta/day mi ŋi eu t tsak mi ceʔ t*
 b. *mi t ca t ta/day t ŋi eu t tsak t ceʔ t*

Fourth, independent evidence shows that nominal coordinators do not take on other morphological forms in the context of certain types of deletion/movement; this is shown in (13a) (confirmed by all our Tibetan informants, felicitous when there are two groups of people, 30 in one group and 5 in the other), in which the noun *mi* ‘person’ is topicalized. In (13a), *day* is still used because after raising or deletion the two conjuncts are still noun phrases not numeral phrases. Some informants had difficulty in understanding (13a) at first but nevertheless accepted it as grammatical in

its intended reading after our explanation. They readily understood (13b), which involves 35 people in one group.

- (13) a. mi ni thakī sum tɕu **daŋ** ŋa lɛ²so:ŋ.
 person TOP just-now three ten CONJ five come
 ‘People, there came thirty (in one group) and five (in another group) just now.’
 b. mi ni thakī sum tɕu **so** ŋa lɛ²so:ŋ.
 person TOP just-now three ten CONJ five come
 ‘People, there came thirty-five (in one group) just now.’

As mentioned earlier, if there are missing powers between two numerals, Tibetan uses a special method not found in the other languages in our survey that entails inserting *tɕu mɛ²* (ten no) or *ca mɛ² tɕu mɛ²* ‘hundred no ten no’, as shown in (6a,b). According to the nonconstituency analysis, (6a) should be derived from (14a), and (6b) should be derived from (14b). This implies that in order to derive the surface forms, the nominal coordinator *ta/daŋ* ‘and’ needs to change to *tɕu mɛ²* ‘ten no’ and *ca mɛ² tɕu mɛ²* ‘hundred no ten no’, which seems entirely unworkable.

- (14) a. mi sum ca **ta/daŋ** mi tɕʰuk
 person three hundred CONJ person six
 ‘300 people and 6 people’
 b. mi sum toŋ **ta/daŋ** mi tɕʰuk
 person three thousand CONJ person six
 ‘3000 people and 6 people’

A proposal that the alternative underlying form of (6a) is (15) does not work, either, because it would require that the two instances of the nominal coordinators *ta/daŋ* should disappear after transformation. Our Tibetan informants stated that *mi tɕu mɛ²* ‘person ten no’ is grammatical in syntax and interpretable in semantics (‘not have ten people’ or ‘less than ten people’), but that the structure as a whole is uninterpretable. When pressed further, some could obtain a reading of ‘296 people in total’, that is, [300 people – 10 people + 6 people]. When there is a lack of semantic equivalence between two structures, it is untenable that the two forms can be derivationally related (see Her & Tsai 2015 for discussion).

- (15) *mi sum ca **ta/daŋ** mi tɕu mɛ² **ta/daŋ** mi tɕʰuk
 person three hundred CONJ person ten not-have CONJ person six

Thus far, we have shown that the proposal that numeral coordination is derived from underlying nominal coordination encounters serious difficulty in Tibetan and that the two kinds of coordinators are different morphemes altogether, and are thus not allomorphs of the same morpheme. There is also reason to believe that it is quite a common phenomenon across languages that different coordinators are used to conjoin

different syntactic categories and that these coordinators are different morphemes and not allomorphs of the same morpheme. One such typical language is Mandarin Chinese, in which nominal phrases are conjoined by *he*, *gen*, *ji*, *yu*, *yiji*, and *jian*; predicative phrases (VP and AP) and clauses are conjoined by *erqie* or *bingqie*, although a null coordinator may be preferable in certain contexts. Particularly within coordinated noun phrases, the coordinator *he* ‘and’ only allows a split reading and the coordinator *jian* ‘and’ is used to express the joint reading (Aoun & Li 2003:141–143). Example (16) means that some are linguists and some are philosophers if *he* is used; but if *jian* is used, it means they are both linguists and philosophers. This example clearly indicates that *he* and *jian* are two different morphemes, because they appear in the same syntactic position, not in complementary distribution, which is a distinctive feature of allomorphy. The two forms are not phonetically similar and, more importantly, they are not semantically equivalent.

- (16) Tamen shi yuyanxuejia **he/jian** zhexuejia.
 they are linguist CONJ philosopher
 ‘They are linguists and philosophers.’

3.2. Other Languages

We obtained firsthand verification of core data for ten other languages. All the data presented in table 6 have been confirmed by at least two native speakers and/or experts in the relevant languages.

Similar to the case of Tibetan, there are good reasons here too why the numeral coordinators and nominal coordinators in these languages are not allomorphs of the same morpheme and are not derivationally related. First, these coordinators are phonetically dissimilar. Second, the numeral coordinators in some languages are semantically different from the nominal coordinators. For example, most numeral coordinators in Austronesian languages are related to verbs. The numeral coordinator in Zaiwa is an adjective meaning ‘empty’, and the numeral coordinator in Dai (and several Austroasiatic languages influenced by Dai) is also an adjective *pa:i* meaning ‘more’, which have other typical adjectival uses. In Ta²aŋ, there are several numeral coordinators but only one nominal coordinator, and the choice of the numeral coordinator depends on the numerals: *lu* between two adjacent powers, *loi* between two powers with one missing power, and *pa:i* between two powers with two or more missing powers. If they were allomorphs, it would be difficult to explain why the same morpheme should take on different forms according to the numerals.

4. Numerals or Coordinators?

Among the languages that we surveyed, the numeral coordinators in some can occur between adjacent powers, including in Achang, Anuŋ, Baima, Jingpo, Pynru, Suloŋ, Xiandao, Ta²aŋ, Atayal, Amis, Bunun, Kavalan, Paiwan, Puyuma, Sakizaya, Thao, and Tsou, and are thus unmistakably coordinators. However, other languages use

Table 6. Verification of the grammaticality of numeral expressions for other languages

Language type and languages	Linguistic structure	Example
Austronesian		
Amis	Numeral expression	a tosa polo' ira ko cecay a tamdaw PARTICLE twenty CONJ ART one PARTICLE person '21 people'
	Alleged source form/correct form	a tosa polo' a tamdaw *ira/atu cecay a PARTICLE twenty PARTICLE person CONJ one PARTICLE tamdaw person 'twenty persons and one person'
Atayal	Numeral expression	magalpug cu qun cuquliq ten CONJ one person 'eleven people'
	Alleged source form/correct form	magalpug cuquliq *cu/ru' taxa cuquliq ^a ten person CONJ one person 'ten persons and one person'
Bunun	Numeral expression	mapus-an han tasa tu asu twenty CONJ one ATTR dog '21 dogs'
	Alleged source form/correct form	mapus-an tu asu *han/mas tasa tu asu twenty ATTR dog CONJ one ATTR dog 'twenty dogs and one dog'
Tsou	Numeral expression	masku- veia uci ci sensi ten-CONJ one ATTR teacher '11 teachers'
	Alleged source form/correct form	masku ci sensi *veia/ho uci ci sensi ten ATTR teacher CONJ one ATTR teacher 'ten teachers and one teacher'
Tibeto-Burman		
Achang	Numeral expression	tʂo ta pak mɔ ta sau zu' [?] people one hundred CONJ one twenty CLF '120 people'
	Alleged source form/correct form	tʂo ta pak zu' [?] *mɔ/lɔ' tʂo ta sau zu' [?] people one hundred CLF CONJ people one twenty CLF '100 people and 20 people'
Jingpo	Numeral expression	tʃum kjin khjin māŋa e tʃākhu tsa salt kilo thousand five CONJ nine hundred '5,900 kilos of salt'
	Alleged source form/correct form	tʃum kjin khjin māŋa *e/the' tʃum kjin tʃākhu tsa salt kilo thousand five CONJ salt kilo nine hundred '5,000 kilos of salt and 900 kilos of salt'
Zaiwa	Numeral expression	səkkam sum ʃo kəm ʃit kam tree three hundred CONJ eight CLF '308 trees'
	Alleged source form/correct form	səkkam sum ʃo kam *kəm/ə' səkkam ʃit kam tree three hundred CLF CONJ tree eight CLF '300 trees and 8 trees'

Table 6. (Continued)

Language type and languages	Linguistic structure	Example
Tai-Kadai		
Dai	Numeral expression	hok pan pa:i sa:u kun six thousand CONJ twenty people '6,020 people'
	Alleged source form/correct form	hok pan kun *pa:i/ɛ sa:u kun six thousand people CONJ twenty people '6,000 people and 20 people'
Miao-Yao		
Miao	Numeral expression	u tshe qa zi le ne two thousand CONJ eight CLF person '2,008 people'
	Alleged source form/correct form	u tshe le ne *qa/kɔ zi le ne two thousand CLF person CONJ eight CLF person '2,000 people and 8 people'
Austroasiatic		
Ta'anj	Numeral expression	(i) ?u ky:r lu? lu ?u lu? (ii) ?u jah loi ?u lu? one ten CLF CONJ one CLF one hundred CONJ one CLF '11 CLF' '101 CLF' (iii) ?u heŋ pa:i ?u lu? one thousand CONJ one CLF '1,001 CLF'
	Alleged source form/correct form	(i) ?u ky:r lu? *lu/ka:i ?u lu? (ii) ?u jah lu? *loi/ka:i ?u lu? one ten CLF CONJ one CLF one hundred CLF CONJ one CLF '10 CLF and 1 CLF' '100 CLF and 1 CLF' (iii) ?u heŋ lu? *pa:i/ka:i ?u lu? one thousand CLF CONJ one CLF '1000 CLF and 1 CLF' (Chen, Wang & Lai 1986:46, 65, 73)

²Careful readers may have noticed that the numeral for 'one' in this expression is *taxa*, not *qun*. In Atayal, there are two morphemes for *one* and *two* each: *qutux/caxa* (1) and *usayng/rarusa* (2). *Qun* (*qutux*) is used for compound numerals while *caxa* (*taxa*) is used to modify nouns. This phenomenon, which is fairly common among minority languages in South China, causes further difficulty to the derivational nonconstituency analysis (He 2015a:198–199, 211–212).

numeral coordinators only between nonadjacent powers but not between adjacent powers—for example, Zaiwa, Nusu, Dai, Miao, Blang, Buxing, Khymet and Kəmu². This is reminiscent of the Chinese morpheme *ling* 'zero', which is used only to conjoin nonadjacent powers, and its loan incarnations occurring in many other languages influenced by Chinese (see sect. 5.2). He (2015a:192) argued that the Chinese *ling* 'zero' within additive numerals should be treated as a numeral not as a coordinator because the form of multiple instances of *ling* is acceptable in Modern Chinese (particularly in a very formal context), although the form with only one instance of *ling* is far more popular regardless of how many missing

- (20) a. *kui kul **pai** pyi.* Blang
 have ten **more** person
 ‘There are a little more than ten people.’ (Li, Nie & Qiu 1986:36)
- b. *Ai ɔʔ pen hok sip nym **pai**.* Khymet
 father my PARTICLE six ten year **more**
 ‘My father is a little more than 60 years old.’ (Chen 2005:90)

Second, unlike Modern Chinese, which still accepts the stacking of *ling* for multiple missing powers, the above numeral coordinators in Dai and Zaiwa do not allow such stacking at all. They can only occur once, regardless of how many powers are missing, as shown in (21).

- (21) a. **pan **pa:i pa:i** sɔŋ to* Dai
 thousand CONJ CONJ two CLF
 ‘1,002 CLF’
- b. **səkkam sum khjiŋ **kɔm kɔm** ʃit kam* Zaiwa
 tree three thousand CONJ CONJ eight CLF
 ‘3,008 trees’

Miao is different. In Jiwei Township (a typical Miao residential area in Huayuan County in the west of Hunan Province, where people speak Miao) where we conducted our field work, the two forms in (22a,b) are both well-formed, but younger people prefer *ljin* (clearly a Chinese borrowing) and older people prefer *qa*. All reject (22c). So, it is unclear whether *qa* within additive numerals is a numeral like the Chinese *ling*. But even though *qa* is a real numeral expressing the numerical value of zero, it still causes problems for the nonconstituency analysis (see He 2015a:204–205 for discussion).

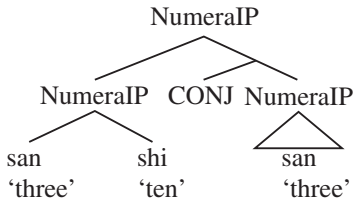
- (22) a. *qa/ljin le ne*
zero CLF person
 ‘zero persons’
- b. *A tɛizɔ a tɔ qa/ljin.*
 one subtract one get **zero**
 ‘One minus one is zero.’
- c. **u tshe **qa qa** zi le*
 two thousand CONJ CONJ eight CLF
 ‘2,008 CLF’

5. Theoretical Implications

5.1. Syntax and Semantics of Numeral Coordination

In the previous sections, we have argued that at least for some languages, additive numerals cannot be derived from nominal coordination. The theoretical implication is

(23)



that nominal coordination and numeral coordination should be distinguished in natural languages. The following is a proposal of the phrase structure for additive numerals, illustrated with a Chinese example (see He 2015a:202, sect. 4.3 [“The ‘&’ head”]) for reasons why a covert coordinator is needed).

It is commonly agreed that nominal coordinators generate a set or a sum of different entities or just many objects at once (see McKay 2006 for an overview); numeral coordinators, although they are morphologically the same as nominal coordinators in some languages, encode different semantic relations in that they generate a bigger number out of smaller ones. Therefore, the *CONJ* morpheme (overt or covert) in (23) contributes a different semantic value from that of nominal coordinators, though they may be homophones. They should be distinguished as different morphemes and should thus be defined differently. If we assume the Fregean view that numerals denote numbers with semantic type *e*, the semantic relation between coordinated numerals is that of *arithmetic addition*, and the numeral coordinator can be defined as *arithmetic addition* ‘+’ as shown in (24a). If we assume that numerals denote sets (type <et>) following Rothstein (2013), then numerals are adjectives defined probably as $\| \text{numeral} \| = \lambda X [|X|=n]$, then possibly the numeral coordinator can be defined as in (24b). Note that there should be a restriction for the *X* and *Y* such that they belong to the same category of objects required for counting (Rothstein 2010), and the equation ‘ $Z=X \cup Y \ \& \ |Z|=|X|+|Y|$ ’ can guarantee that there is no overlapping among the objects.

$$(24) \text{ a. } \| \text{CONJ}_{\text{numeral}} \| = \lambda m \lambda n [m+n]$$

$$\text{ b. } \| \text{CONJ}_{\text{numeral}} \| = \lambda P \lambda Q \lambda Z \exists X Y [X \in P \ \& \ Y \in P \ \& \ Z = X \cup Y \ \& \ |Z| = |X| + |Y|]$$

In both treatments, the semantics of *CONJ*_{numeral} contains *arithmetic addition*, which distinguishes numeral coordinators from nominal coordinators. This is best illustrated in the fact that the numeral coordinators in some languages we have discussed are etymologically verbs or adjectives, conveying a meaning along the lines of ‘add, supplement, exceed, or count’. Given the semantic relation of arithmetic addition between coordinated numerals, numeral coordination may be subject to certain arithmetically driven syntactic restrictions that nominal coordination is immune to. For example, nominal coordination does not seem to formally impose an order restriction on the conjuncts—that is, the two expressions *Jack and Jill* and *Jill and Jack* are semantically equivalent. Although the addition of numbers is commutative

($10 + 3 = 3 + 10$), additive numerals are subject to a sequential order, as shown in the contrast between *one hundred and two* and **two and one hundred*. According to Hurford (2007), this order restriction in numerals is a consequence of a counting principle “Go as far as you can with the resources you have.” We can thus further interpret this word-order restriction in additive numerals as an example of the grammaticalization of a functional principle.

5.2. A Typology of Numeral Coordination

We cautiously propose that the syntax–semantics for numeral coordination sketched here is universal and applicable to numeral coordination in all languages (except those that may not have surface numeral coordination, such as Biblical Welsh and Kalabari), including languages that use the same phonetic forms for both numeral and nominal coordinators, as well as languages that use covert coordinators. Through our survey of more than 100 minority languages, we found that both of the latter types of languages are widely attested. In some languages, the numeral coordinators are of the same phonetic forms as the nominal coordinators, including Bai (*liu*), Guiqiong (*le*), Lavrung (*ræ*), Monba (*daŋ*), Muya (*rə*), Namuyi (*na*), Naxi (*ne*), Nosu (*sini*), Primi (*nə*), Qiang (*na*), Then (*thim*), Tosu (*la*), and Zhaba (*nə*). Covert coordination is also common in languages such as Bola, Bugar, Derung, Hani, Jinuo, Kuman, Lhao Vo, Sangkong, and others.⁹ These languages are all Tibeto-Burman languages, spoken mainly in the remote Himalayan hinterlands and Yunnan Province in Southwest China.

Some of the languages that do not have overt coordinators within additive numerals use a special “zero” morpheme to fill in missing powers only. This is due to the influence of the Chinese *ling* ‘zero’. These “zero” morphemes are phonetically adapted as loan words. Examples of languages in which this occurs include Biao (*liaŋ*), Bouyei (*lij*), Bunu (*lij*), Buyang (*lan*), Chadong (*ləŋ*), Cun (*ləŋ*), Gelao (*lij*), Huihui (*lin*), Jiamao (*lej*), Jing (*len*), Kam (*ljən*), Khatso (*li*), Lai (*le*), Lakkia (*lej*), Lashi (*lɔ*), Lin’gao (*lej*), Mang (*lij*), Maonan (*li:ŋ*), Mjen (*lej*), Mulam (*lij*), Sui (*ljen*), Taliu (*ŋi*), Tujia (*lin*), and Younuo (*lən*).¹⁰ These languages belong to Miao-Yao and Tai-Kadai, which are spoken in the provinces of Hunan, Guangxi, Guizhou, Yunnan, and Hainan, where the cultural and linguistic influence from Chinese is

⁹ Example (i) is from Qiang, the former type, and (ii) is from Lhao Vo and Sangkong, the latter type.

(i) a. χ ma **na** dzuə b. a tʃʃi **na** χ a dy **na** a
millet conj chestnut one hundred conj one ten conj one
‘millets and chestnuts’ ‘111’
(Sun, Hu & Huang 2007:852, 861)

(ii) a. tǎ jə ta Lhao Vo b. ɛa ɛɛ Sangkong
one hundred one hundred eight
‘101’ ‘108’

¹⁰ The following examples are from Chadong and Taliu.

(i) a. ji pek **ləŋ** jit Chadong b. tʃʃi xō ŋi ŋo Taliu
one hundred **zero** one one hundred **zero** five
‘101’ ‘105’

Table 7. Typology of numeral coordinations of languages in South China

Typology of numeral coordination	Numeral coordinators		Example languages
	Surface form	Homophony with nominal coordinators?	
Type 1	Covert	Not applicable	Lhao Vo, Sangkong
Type 2	Overt	Yes	Qiang, Guiqiong
Type 3	Overt	No	Tibetan, Amis
Type 4	<i>Ling</i> ‘zero’ morpheme	<i>Ling</i> is treated as a numeral <i>Ling</i> is treated as a coordinator	Chinese Perhaps Miao

great. It is not clear at this point whether the “zero” morphemes in these Miao-Yao and Tai-Kadai languages are numerals or coordinators because of a lack of confirmation as to whether they allow consecutive “zero” morphemes in numerals.

A typology of numeral coordination thus emerges, with different languages using different morphological strategies to conjoin numerals (see table 7). The conjoining morpheme may be overt or covert. In the case of overt coordination, the coordinators need not be of the same phonetic forms as the nominal coordinators. In these situations, they may have diverse etymologies, with many numeral coordinators etymologically derived from verbs and adjectives. This is the case for the 26 languages discussed in this paper.

We have argued that numeral coordination in Type 3 languages cannot be derived from nominal coordination. For Type 4 languages, if *ling* is treated as a numeral, the argument concerning the Chinese *ling* against the nonconstituency analysis also applies to these languages; if *ling* is treated as a coordinator, the argument put forth in this paper also applies to these languages because these languages have different nominal coordinators (see table 8).

For Type 1 and Type 2 languages, our argument does not apply. It is possible that additive numerals are derived from NP coordination in these languages, as Hurford (1987:226–238) proposed, which has a much more detailed discussion of the type of theory proposed by I&M (but see He 2015a for possible problems based on other arguments). However, Hurford (1987:237) cautioned that “[i]t is not claimed that this is the *only* way in which complex numerals could arise.” He cited Fijian numerals as an example in which numerals are conjoined by *a*, which also conjoins clauses and phrases (the noun coordinator ‘*ei*’ cannot be used). He further commented that “[i]n the light of such facts, it must be admitted that additive constructions do not always arise from conjunctions of NPs, although this may well be their most typical evolutionary source. . . It would be interesting to investigate cases like Fijian further, rare though they are.” Hurford’s remarks are robustly demonstrated to be true in this paper, and cases such as Fijian are not rare. Among more than 100 languages surveyed in this article, nearly one third belong to this category.

6. Conclusion

In this article, we investigated a special typology of overt coordination in additive numerals of minority languages spoken in South China. It is found that among

Table 8. Nominal coordinators in Type 4 languages (surveyed from Sun, Hu & Huang 2007)

Language	Nominal coordinator	Example
Biao	<i>kuŋ</i>	tsai kuŋ tsy bowl CONJ chopstick 'bowls and chopsticks'
Bouyei	<i>tiam</i>	tu ni tiam tu ti CLF this CONJ CLF that 'this and that'
Bunu	<i>pu</i>	aŋ pu to water CONJ fire 'water and fire'
Buyang	<i>qha</i>	zūk qha lava:k palm tree CONJ camphor tree 'palm trees and camphor trees'
Cun	<i>nam</i>	hə lət azə nam tuək na that CLF old man CONJ son his 'that old man and his son'
Gelao	<i>tsha</i>	tsu tsəŋ tsha mpaŋ pen CONJ ink 'pens and ink'
Huihui	<i>ŋan</i>	ha ŋan thaimai you CONJ sister 'you and sister'
Jing	<i>vəi</i>	oŋthəi vəi həkto teacher CONJ student 'teachers and students'
Kam	<i>taŋ</i>	tu na:i taŋ tu ta CLF this CONJ CLF that 'this and that'
Khatso	<i>ku</i>	koko ku older brother CONJ titi ku younger brother CONJ 'older brothers and younger brothers'
Lai	<i>le</i>	?a:u le mi I CONJ you 'I and you'
Lakkia	<i>kap</i>	tsi kap ma I CONJ you 'I and you'

Table 8. (Continued)

Language	Nominal coordinator	Example
Lashi	<i>jɔ</i>	apho jɔ amji father CONJ mother ‘father and mother’
Lin’gao	<i>hem</i>	ma hem mo dog CONJ pig ‘dogs and pigs’
Mang	<i>zua</i>	vantey zua tətəua man CONJ woman ‘men and women’
Maonan	<i>ɖam</i>	fiɛ ɖam man I CONJ he ‘I and he’
Mjen	<i>tshin</i>	noku tshin noŋu owl CONJ dove ‘owls and doves’
Mulam	<i>wən</i>	lɟem wən tsui sickle CONJ hammer ‘sickles and hammers’
Sui	<i>kɛp</i>	pəkjiu kɛp məifənli scissor CONJ ruler ‘scissors and rulers’
Taliu	<i>ŋɛ</i>	ŋazo ŋɛ ŋamo brother CONJ sister ‘brothers and sisters’
Tujia	<i>ne</i>	lapu ne tɛhipu salt CONJ bean ‘salt and beans’
Younuo	<i>la</i>	pje tuŋ ŋu la three CLF cow CONJ pi tuŋ zaŋ five CLF sheep ‘three cows and five sheep’

approximately 100 minority languages, 26 languages feature different coordinators for additive numerals from noun phrases and that these two types of coordinators are not semantically, etymologically, or morphologically related. We showed that this phenomenon strongly indicates that additive numerals are not syntactically derived from nominal coordination. We made some specific suggestions to formally distinguish the syntax and semantics of numeral coordination from that of nominal

coordination, and outlined a typology of numeral coordination, of which Type 3 languages have particular value to the study of the syntax of natural language numerals. We believe that Type 3 languages can be found in other parts of the world.

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