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The Anatolian stop system and the Indo-Hittite hypothesis

Abstract: This article argues that the phonetic distinction between the Hittite fortis and lenis stops was not one of voice, but rather one of length, and that this distinction must have been present in Proto-Anatolian as well. On the basis of typological and comparative considerations it is argued that the Proto-Anatolian stop system cannot have developed from the stop system that is traditionally reconstructed for the Proto-Indo-European mother language and in which voice is the basic distinction. Instead, the relationship must have been the other way around: the voice distinction of PIE is a younger development of the length distinction as found in the Proto-Anatolian stop system. This relationship can only be accounted for within the context of the Indo-Hittite hypothesis, and therefore forms a new argument in favor of it.

Keywords: Hittite, Anatolian, Proto-Indo-European phonology, Indo-Hittite hypothesis, consonantal length

1 The Hittite stop system: the word-internal position

As is well known, in 1932 Sturtevant described the fact that Hittite has a phonemic difference between a series of geminate spelled stops (*pp*, *tt/dd*, *kk/gg*, and *kku*) and a series of single spelled stops (*p*, *t/d*, *k/g*, and *ku*), and that the geminate ones in principle regularly correspond etymologically to the consonants that for PIE are reconstructed as voiceless stops (*$*p$*, *$*t$*, *$*ḱ/k$*, *$*kʷ$*), whereas the single ones correspond to the consonants that for PIE are reconstructed as plain voiced stops (*$*b$*, *$*d$*, *$*ǵ/g$*, *$*gʷ$*) and as aspirated voiced stops (*$*bʰ$*, *$*dʰ$*, *$*ǵʰ/gʰ$*, *$*gʷʰ$*) (Sturtevant 1932). Thus for instance *kat-**ta*** 'downwards' ∼ Gr. κάτα 'down(wards)' < PIE *$*ḱmto$* versus *a-**t**a-an-zi*, *a-**d**a-an-zi* 'they eat' ∼ Skt. *a**d**-*, Gr. ἐδ-, etc. 'to eat' < PIE *$*h_1ed$*-. In Hittite linguistics, this observation has since then been called Sturtevant's

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Law,[1] and the two series are usually referred to with the terms 'fortis' and 'lenis', respectively.

In most handbooks nowadays, scholars have stated (some with more hesitation than others) that the synchronic phonetic difference between the fortis (i. e. geminate spelled) and lenis (i. e. single spelled) series is probably one in voice: the fortis series is thought to have been voiceless ([p], [t], etc.), whereas the lenis series would be voiced ([b], [d], etc.).[2] As I have argued on several occasions,[3] this can hardly be correct, for the following two reasons.

1. If the distinction between fortis and lenis stops were one in voice, it would be unaccounted for why the Hittite scribes in their writing of these stops did not use the voice distinction that is available in the cuneiform script that they adapted from Mesopotamia (cf. the existence of the signs PA vs. BA, KA vs. GA, TA vs. DA, etc.), but instead would have invented a much more complicated system of single vs. geminate spelling.[4]

2. There are certain words whose phonetic interpretation would be difficult if the distinction between fortis and lenis stops was one in voice. Consider for instance the word 'he drank', which is spelled *e-ku-ut-ta* as well as *e-uk-ta*. Because of this spelling alternation, we know that the *u* in *ekutta* is not a vowel, but rather the graphic representation of the labial element of a labiovelar,[5] which means that we are dealing here with a cluster of a lenis labiovelar and a fortis dental stop. If the distinction between fortis and lenis stops were one in voice, this would mean that this word was [ʔégʷta], containing a cluster of a voiced and a voiceless stop. This is extremely unlikely: we would expect such a cluster to be instantly subject to voice assimilation. It should either have

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1 Cf. Pozza 2011 for a monographic treatment of Sturtevant's Law. Although this work discusses all the relevant material and recent literature, I cannot agree with its main conclusion, namely that Sturtevant's Law is not a Law, but rather a "generalization" (Pozza 2011: 712–3). To my mind, all counterexamples to Sturtevant's Law that his book adduces to demonstrate its irregularity can be explained by formulating fortition or lenition rules, for which see Kloekhorst 2014: 543–96.

2 E. g. Luraghi 1997: 3–4; Kimball 1999: 54; Watkins 2004: 556; Vanséveren 2006: 39–40; Hoffner & Melchert 2008: 35 ("For the sake of simplicity we here describe the contrast in stops as one of voicing, but we do not mean thereby to take a definitive stance on this issue."); Weiss 2009a: 90; van den Hout 2011: 64; Rieken 2011: 39 ("Es ist aber nicht klar, ob es sich bei der genannten phonemischen Distinktion tatsächlich auch phonetisch um einen Kontrast zwischen stimmhaft und stimmlos handelt [...]. Der Konvention entsprechend ist im Folgenden stets von stimmhaften und stimmlosen Plosiven die Rede").

3 Kloekhorst 2008a: 21–5; 2014: 544–7.

4 For a rejection of Kimball's theory that the Hittites took over this system from Hurrian (Kimball 1999: 53–4), see Kloekhorst 2008a: 22 and Kloekhorst 2014: 545[2057].

5 This is supported by the fact that the ending is *-tta*, which is only used in postconsonantal position, as opposed to the postvocalic 3sg.pret.act. ending *-t*.

become voiceless, [kʷt] (compare e. g. Skt. *yuktá-* < **i̯ug-tá-*), which would then have been spelled ****e-ek-ku-ut-ta*, or the cluster should have become voiced, [gʷd] (compare e. g. Av. *aogədā* < **Haugʰ-ta*), which would have been spelled ****e-ku-ta*. Since neither of these developments took place, the two stops apparently were not distinct in voice.

I have instead argued that the distinction between fortis and lenis stops was one in consonantal length: the fortis stops were long, whereas the lenis stops were short. There are several reasons for this interpretation.

1. In Akkadian, geminate spelling represents the presence of long consonants, which are phonemically distinct from short consonants, which are spelled single. Since it is now commonly assumed that the Hittites have taken over the cuneiform script directly from territories speaking Akkadian (Old Babylonian),[6] it is only natural to assume that when they took over the practice of geminate vs. single spelling, they did so in order to spell a phonetic distinction that is similar to the one expressed by it in Akkadian, namely a distinction in consonantal length.

2. In the prehistory of Hittite, long */ī/ is shortened in closed syllables, but not in open syllables: cf. OH *kišḫa* /kísh:a/ 'I become' < pre-Hitt. */kĩsh:a/ < **Kéis-h₂e* vs. *kīša* /kĩsa/ 'he becomes' < **Kéis-o*.[7] Also in the 3sg.pres.mid. form *kitta* /kít:a/ 'he lies', which must reflect pre-Hittite */kĩt:a/ < **Kéi-to*, such a shortening of long */ī/ to /i/ has taken place.[8] This indicates that the fortis stop *-tt-* counted as a closing factor. This can only be explained by assuming that this consonant, even though it corresponds to the PIE phoneme *t, which is generally assumed to have been a single, short stop, was in Hittite phonetically realized as a long stop, [t:]. By contrast, lenis stops do not close the syllable, as can be seen by e. g. ᴸᵁ*kīta-* /kĩta-/, a cult functionary.[9] In this word, the long /ī/ remained long, which indicates that the single spelled stop *-t-* did not close the syllable and therefore must have been a short stop.

3. Any Old Hittite long /ā/ that stands in a closed, non-final syllable is shortened within the MH period to /a/.[10] This rule not only applies to cases where OH /ā/ stands before a cluster (e. g. OH *šipānti* > NH *šipanti* 'he libates', OH *iškārḫi* > NH *iškarḫi* 'I stab', MH *tamāšzi* > NH *tamašzi* 'he oppresses', etc.), but also when standing before geminate spelled stops. For instance, OH *dātten* > NH

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6 Cf. Rüster & Neu 1989: 15.

7 Cf. Kloekhorst 2014: 418–9.

8 Cf. Kloekhorst 2014: 419–20.

9 Cf. Kloekhorst 2014: 474.

10 Cf. Kloekhorst 2008a: 98 and, more extensively, Kloekhorst 2014: 256–307.

datten 'you must take', OH *dātti* > NH *datti* 'you take', OH *šākki* > NH *šakki* 'he knows'. This contrasts with the development of OH /ā/ when standing before single spelled stops, which remains long, e. g. *sākuu̯a-* 'eye', *antuḫšātar* 'humanity'.[11] This indicates that the geminate spelled stops count as closing factors, and therefore must have been long: *dātten* = [tʔáːt:en], *dātti* = [tʔáːt:i], *šākki* = [sákːi].

On the basis of these considerations we must assume that Hittite knew two distinct series, a long one (/p:/, /t:/, etc.) and a short one (/p/, /t/, etc.), whose contrast was in length only, and not in voice.[12] An additional argument in favor of this view is the following:

4. In the case of fricatives and resonants, too, we find in intervocalic position a distinction between single spelling (*š*, *ḫ*, *r*, *l*, *m*, *n*) and geminate spelling (*šš*, *ḫḫ*, *rr*, *ll*, *mm*, *nn*). Although we occasionally come across the view that lenis *ḫ* must have been the voiced variant of fortis *ḫḫ*, [ɣ] vs. [x] *vel sim.* (e. g. Melchert 1994: 68), it is never claimed that the distinction between single spelled *š*, *r*, *l*, *m*, *n* and geminate spelled *šš*, *rr*, *ll*, *mm*, *nn* was one in voice. This matches the above interpretation of the distinction between fortis and lenis stops. I therefore assume that also for these fricatives and resonants, including *ḫ(ḫ)*, the distinction between fortis and lenis was one in consonantal length: the single spelled, lenis consonants were in fact short ([s], [χ], [r], [l], [m], [n]),

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11 Cf. Kloekhorst 2014: 344–73.

12 In Kloekhorst 2013: 139–40, I argued that in intervocalic position the short (= lenis) stops were allophonically voiced. Yet since this is certainly not so in clusters, as we have seen in the case of *ekutta* [ʔekʷt:a], I maintain that this voicing is sub-phonemic only, and that the real phonemic distinction between fortis and lenis stops is not one in voice, but in consonantal length. Note that Melchert's 1994 interpretation of the Hittite stop system (Melchert 1994: 13–21) is close to mine. He states that fortis stops were in fact geminate voiceless stops, "*-TT-*", whereas lenis stops were in fact voiced single stops, "*-D-*". Besides these two kinds of stops, Melchert also assumes "the existence of a few secondary geminate voiced intervocalic stops", "*-DD-*", which according to Melchert (1994: 20) would have occurred in e. g. *kappi-* 'small' < **kómbi-*, "the double *-pp-* [of which] is most plausibly explained as [-bb-], assimilated from **-mb-*". Yet Melchert does not clearly state to what extent he assumes that the series of geminate voiced stops was phonemically distinct from the two other series. He does state, however, that since "[t]he operative contrast [between *-TT-* and *-D-*] is one of long vs. short, [… t]he few cases of *-DD-*, being long, were unsurprisingly identified with the fortis set. The voicing quality of both the long and short medial stops would now have been open to free variation" (1994: 20–1). Although he does not explicitly say so, this effectively means that Melchert also thinks that the phonological distinction between fortis and lenis stops was not one in voice, but rather one in consonantal length only: /p:/, /t:/, etc. vs. /p/, /t/, etc.

whereas the geminate spelled, fortis ones were in fact long ([s:], [χ:], [r:], [l:], [m:], [n:]).

Apart from possessing short and long consonants, I have argued in Kloekhorst 2013: 127–31 that in its synchronic stop system Hittite also has a series of long, post-glottalized stops, /t:ʔ/, etc., which in the case of the dentals is spelled by geminate spelling with the sign DA, *(-)Vd-da(-)*, as opposed to geminate spelling with the sign TA, *(-)Vt-ta(-)*, which represents the presence of a plain long /t:/. Since this post-glottalized series is a specific Hittite development that results from original clusters of stops + laryngeals, *TH* (e. g. *pád-da-* 'to dig' = /pat:ʔa-/ < *$b^h od^h h_2$-, *píd-da-a-i* 'he flees' = /pit:ʔái/ < *pth_1-ói-, *pád-da-nᵒ* 'basket' = /pat:ʔan-/ < *$pVth_2$-én-, etc.), they are irrelevant for the remainder of this article, and I will therefore leave them out of consideration.

2 The Hittite stop system: word-initial position

For word-initial position, it is usually stated that in Hittite there is only one type of stop, namely a fortis/voiceless one.[13] As I have argued elsewhere, this view cannot be upheld, because of the following reasons.

1. In Kloekhorst 2010: 202–7, I treated the difference in the phonetic interpretation of the signs TA and DA in word-initial position in Old Hittite texts, and argued that consistent spelling with the sign TA denotes the presence of a plain voiceless stop, [t], which corresponds with PIE *t, *d, and *d^h, but that consistent spelling with the sign DA rather points to the presence of a post-glottalized stop, [tʔ], which is the outcome of PIE *TH-. In hindsight, I missed a third category, however. In the overview of spellings of Old Hittite words beginning with a dental stop + *a* (Kloekhorst 2010: 204), there is one word that shows forms that are spelled with TA as well as forms that are spelled with DA, namely *t/dantukišn-* 'mortality' (five times attested with TA, and fourteen times attested with DA). I commented on this word that since it "may well be of foreign origin, its fluctuation in spelling should not concern us too much: we are probably dealing with a phoneme from another language that was adapted to the Hittite phonemic system in different ways by different speakers" (Kloekhorst 2010: 204). Although I still think that this word is of a foreign origin, I now think that the fluctuation in spelling between TA and DA in fact

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13 Melchert 1994: 18–20; Luraghi 1997: 2; Watkins 2004: 558; Vanséveren 2006: 40; Hoffner & Melchert 2008: 36; Rieken 2011: 40; van den Hout 2011: 65.

points to one specific pronunciation. Just as in intervocalic position and after *n* a fluctuation in spelling between TA and DA points to the presence of a voiced stop, [d] (cf. Kloekhorst 2013: 131–40), I now think that in word-initial position too this spelling fluctuation must be interpreted as denoting a [d]. This means that in word-initial position we find three different stops, a voiceless one, [t], a post-glottalized one, [t^ʔ], and a voiced one, [d]. It seems obvious to me that we should equate these three stops with the intervocalic ones in the following way: (1) the word-initial voiceless stop, [t], is to be equated with the fortis stop /tː/; (2) the word-initial post-glottalized stop, [t^ʔ], is to be equated with the post-glottalized stop /tː^ʔ/; and (3) the word-initial voiced stop, [d], is to be equated with the lenis stop /t/. In other words, also in word-initial position we find the three phonemically distinct stops that we find in intervocalic position as well: fortis /tː/ (phonetically realized as [t]), post-glottalized /tː^ʔ/ (phonetically realized as [t^ʔ]), and lenis /t/ (phonetically realized as [d]).

2. An identical system is found for the velar stops (cf. Kloekhorst 2010: 211–24). Most Hittite words starting in a velar + *a*, *e*, *i* show a consistent spelling either with *k*-signs or with *g*-signs, which are distributed according to the etymological values of their initial consonant: the words using *k*-signs correspond to words beginning with PIE **ḱ/k*, whereas words using *g*-signs correspond to words beginning with PIE **ǵ/g* or **ǵʰ/gʰ*. When we find a real fluctuation between *k*- and *g*-signs, this corresponds to etymological *KH-. This means that for the velars too we can set up three distinct phonemes for word-initial position: (1) consistent spelling with *k*-signs points to the presence of a voiceless stop, [k], which is to be equated with fortis /kː/; (2) fluctuation in spelling between *k*- and *g*-signs points to the presence of a post-glottalized stop, [k^ʔ],[14] which is to be equated with post-glottalized /kː^ʔ/; and (3) consistent spelling with *g*-signs points to the presence of a voiced stop, [g], which is to be equated with lenis /k/. So here as well we find in word-initial position the same three phonemically distinct stops that we find in intervocalic position: fortis /kː/

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14 Since the best example of this phoneme is the verb *k/ginu-^{zi}* 'to open', which reflects PIE **ǵʰh₂i-neu-*, I argued in Kloekhorst 2010: 216–7, that its initial stop probably was a glottalic voiced stop, [g^ʔ]. I now want to retract this view, for several reasons. First, post-glottalized voiced stops simply do not exist in the languages of the world. Second, in the case of the dental post-glottalized stops deriving from *TH, it has in the meantime become clear that a laryngeal first causes fortition of a preceding lenis stop, and only then is reinterpreted as glottalization, e. g. **bʰodʰh₂-* > */potʔ-/ > */potː^ʔ-/ > *padd(a)-* = /patː^ʔ(a)-/ (cf. Kloekhorst 2013: 130–1). Since we know that laryngeals caused fortition of a preceding lenis stop also in the case of velars (cf. **meǵh₂-i-* > *mekki-* 'much, many'), it is only natural to assume that in the PIE cluster **ǵʰh₂-* first the *ǵʰ underwent fortition, and only then became glottalized. The outcome of this process in initial position was probably [k^ʔ].

(phonetically realized as [k]), post-glottalized /k:ʔ/ (phonetically realized as [kʔ]), and lenis /k/ (phonetically realized as [g]).

3. In the case of labials we also find that although the bulk of words starting in labial stop + *a* are consistently spelled with the sign PA, there are a number of words that often show spelling with the sign BA.[15] This indicates that in word-initial position Hittite had two distinct labial sounds, namely [p] and [b], which I would phonologically interpret as /p:/ and /p/, respectively.[16]

Since, as we have seen above as well, the post-glottalized series is a specific Hittite development that results from original clusters of stops + laryngeals, **TH*, they are irrelevant for the remainder of this article.

In the case of the fortis and lenis stops, it is interesting to see that, despite the fact that phonologically their difference is one of consonantal length, in word-initial position they are phonetically realized as voiceless vs. voiced stops, respectively. It can be proven, however, that this phonetic realization came about relatively recently, and that in pre-Hittite times their phonetic difference was one of consonantal length. The argument runs as follows:

4. It is well known that the Hittite dentals prehistorically underwent an assibilation when standing in front of an **i* (which itself was lost in this process if it was consonantal). For instance, Hitt. *zaḫḫ-* 'to do battle' derives from a preform **tieh₂-*, in which **ti-* yielded *z-*,[17] whereas Hitt. *šīu-* 'deity' derives, through an earlier **/sḗu-/*, from a preform **diḗu-*, in which **di-* yielded *š-*.[18] As we see, there is a difference in the outcome of PIE **ti-* and **di-*,[19] which proves that at the time of assibilation there was still a phonemic difference between the original fortis and the lenis dental series. Since assibilation is a specific Hittite phenomenon (e. g. Luwian has not undergone it, cf. CLuw. *tiuat-* 'sun-god' vs. Hitt. *šīuatt-* 'day', both from **diéuot-*), this difference must still have been present in post-PAnat., pre-Hittite times. Moreover, the assibilation provides a crucial argument for determining the exact phonetic difference between the fortis and lenis dentals at that moment. As we have seen, the outcome of PIE **ti-* is Hitt. *z-*, i. e. /tˢ/ = [t͡s], whereas the outcome of PIE **di-* is *š-*, i. e. /s/ = [s]. The difference in outcome between the two would be inexplicable if the two clusters only differed phonetically from each other in voice: we would then

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15 Cf. Kloekhorst 2010: 225–6, with a slightly different interpretation.

16 As far as I am aware, there is no evidence for a post-glottalized labial stop [pʔ].

17 Kloekhorst 2008a: 1019–20.

18 Kloekhorst 2008a: 763.

19 Although no good examples are available, I assume that **dʰi-* would have yielded the same as **di-*.

expect an outcome [t͡s] vs. [d͡z], or [s] vs. [z]. Instead, the difference in outcome between *ti̯- and *di̯- can only be explained by assuming that phonetically the fortis and the lenis dental stop differed from each other in consonantal length: *ti̯ = *[t:j] > *[tːʲ] > [t͡s] = /tˢ/, whereas *di̯ = *[tj] > *[tʲ] > [s] = /s/.[20]

To my mind, this proves that in absolute word-initial position too, Hittite had a distinction between fortis and lenis stops which in its recent prehistory was phonetically realized as one in consonantal length.[21]

3 The Hittite stop system: word-final position

When it comes to word-final position, Melchert (1994: 85) states that in Hittite "[v]oiced stops had been generalized", for which he adduces the form "*pa-i-ta-aš* /páyd-as/ 'went he' < PIE *-t" as evidence. Although this view has been followed by many scholars,[22] it can hardly be right, for the following reasons.[23]

1. The example *paitaš* '(s)he went', which consists of the 3sg.pret. form *pait* 'went' to which the enclitic pronoun =*aš* '(s)he' is added, cannot be used as evidence, since the single spelling of *t* in this form is grammatically relevant. If the form were *paittaš*, with a geminate -*tt*-, it would have to be analyzed as *pait* + =*i̯a* + =*aš* '(s)he went as well', in which the geminate -*tt*- marks the presence of the conjunction =*i̯a* 'and, also, as well'. In other words, the lenis character of the *t* in *pait=aš* is inextricably bound to the absence of =*i̯a*, and therefore cannot be used as an indication for the phonemic character of the word-final consonant of *pait* 'went' when no enclitics are attached to it.[24]

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20 Cf. Kloekhorst 2008a: 92 for this analysis, although at that time I had not yet realized its consequences.

21 Although phonemic consonantal length in word-initial position is cross-linguistically rare, it certainly is attested, for instance in the Thurgovian dialect of Swiss German (Kraehenmann 2001), in Pattani Malay (Abramson 1987), and in Leti, Chuukese, Cypriot Greek, and Luganda (Muller 2001). Cf. also footnote 30.

22 Vanséveren 2006: 40; Hoffner & Melchert 2008: 36; Rieken 2011: 40; van den Hout 2011: 65.

23 Moreover, "[t]ypologically, final voicing of stops is a rarity, perhaps even unparalleled" (Weiss 2009a: 155[34]). The only other alleged case within the Indo-European language family is Latin, where PIE *-t has yielded -d (e. g. OLat. *sied* 'be' < PIE *h₁sieh₁t). Yet this case is better explained as a case of word-final pre-glottalization, *-t > *-ʔt (which is a typologically common phenomenon, cf. Kümmel 2007: 187), after which the pre-glottalized stop yielded Lat. *d. Cf. below for an introduction to the pre-glottalic theory.

24 Cf. Kloekhorst 2008a: 24. Put differently: although in the preform *h₁pói-h₁(e)it=os the *t was subject to Eichner's second lenition rule (lenition of intervocalic fortis consonants in a posttonic

2. On the basis of a comparison of *takku* 'if' and *nekku* 'neither', which show a geminate spelled word-final labiovelar stop,[25] with *eku* 'drink', which shows a single spelled one, we must conclude that synchronically there was a phonemic distinction between fortis and lenis labiovelars, the phonetic realisation of which was consonantal length: /takʷ:/ and /nekʷ:/ vs. /ʔekʷ/.[26]

But since *takku* and *nekku* derive from **tokʷe* and **nekʷe*, respectively, in which unaccented word-final **e* was lost, one could argue that the development of word-final fortis consonants in Hittite is a recent phenomenon only, and that these words do not prove an inherited distinction between word-final fortis and lenis stops. There is, however, other evidence in favor of original word-final fortis stops.

3. The word *šeppitt-* 'grain', which is commonly derived from a PIE preform **sépit-* with a stem-final **t*, shows in the oldest stages of Hittite a gen.sg. form spelled *še-ep-pí-da-aš*, pointing to a phonological form /sép:itas/, with a stem-final lenis /t/. It is generally assumed that this lenis /t/ derives from PIE **t* through the second Anatolian lenition rule, which states that original fortis stops are lenited when standing between two unaccented vowels in a posttonic position (see also below). Already in Old Hittite, the form *še-ep-pí-da-aš* is replaced by *še-ep-pí-it-ta-aš*, however, with geminate spelling of the *-tt-*, pointing to the presence of a fortis /t:/. It is commonly thought that this means that the original stem-final fortis consonant has been restored throughout the paradigm. The question now is: on the basis of which form did this restoration of /t:/ take place? Since in all oblique case forms of this word the stem-final consonant would stand between two unaccented vowels in a posttonic position, and therefore in a pre-stage of Hittite would have undergone lenition (dat.-loc.sg. **šeppiti* < **/sép:it:i/, instr. **šeppitit* < **/sép:it:et:/, nom.-acc.sg.pl. **šeppida* < **/sép:it:ā/, dat.-loc.pl. **šeppidaš* < **/sép:it:os/*, etc.), these forms cannot have been the source of the restored /t:/. This leaves only one possibility, namely that the stem-final fortis /t:/ was restored from the nom.-acc.sg. form *šeppit*.

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position), this need not have been the case when **h₁pói-h₁eit* had no enclitic particle attached to it, since in that case **t* does not stand in an intervocalic position and therefore the lenition rule does not apply.

25 Note that the *-u* in *takku* and *nekku* is not a real vowel, but merely the graphic representation of the labial element of the labiovelar, cf. Kloekhorst 2014: 615.

26 Kloekhorst 2008a: 24–5.

This requires, however, that this form was phonologically /sépːit:/,[27] with a word-final fortis /tː/ that directly reflects PIE *t.[28]

Since in *šeppit* /sépːit:/ 'grain' < *sépit* we have a case of a word-final fortis stop corresponding to a PIE voiceless stop, whereas in *eku* /ʔekʷ/ 'drink!' < *$h_1$égʷʰ* we have a case of a word-final lenis stop corresponding to a PIE voiced aspirated stop, I think it is fair to assume that also in word-final position Hittite has preserved the original distinction between fortis and lenis stops, and that this distinction was phonetically realized as one in consonantal length.

4 The Hittite stop system: conclusions

On the basis of the foregoing sections, we can conclude that in Hittite there was a phonemic distinction between fortis and lenis stops that was phonetically realized as one in consonantal length and that was present in word-initial,[29] medial as well as final position.[30]

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27 One may ask the question why a form /sépːit:/ would not be spelled ****še-ep-pí-it-ta*, like e. g. *iš-ḫa-an-ta* /ishːánt/ 'with blood', or *ki-iš-šar-ta/ki-iš-šar-at* /kisːárt/ 'with the hand'. First, in the case of *išḫanta* and *kiššarta* we are dealing with a word-final cluster, whereas /tː/ is a monophoneme (as we will see below as well). Secondly, a spelling ****še-ep-pí-it-ta* could also be read /sépːit:a/, the nom.-acc.pl. form to /sépːit:/. Apparently, making explicit the difference between the presence or absence of a word-final vowel was deemed more important than making explicit the presence of a word-final fortis stop. Only in the case of labiovelars, where the presence of a graphic vowel was needed anyway, the nature of the word-final stop was consistently expressed in spelling.

28 Cf. Kloekhorst 2014: 562–3.

29 Although for this position it can strictly speaking only be proven for a recent pre-stage of Hittite that the phonemic difference between fortis and lenis stops was phonetically realized as one in consonantal length.

30 The system that I propose here, with Hittite contrasting short and long consonants in word-initial, intervocalic and word-final position, is also found,for instance, in languages of North Africa, like Tashlhiyt Berber (cf. Ridouane 2007, who cites minimal pairs like *tut* 'she hit' vs. *t:ut* 'forget him' vs. *ut:* 'hit him!', *tidi* 'sweat' vs. *tid:i* 'size', *juf* 'he was better' vs. *juf:* 'he puffed', and forms like *g:r* 'touch!', *bk:s* 'engirdle!', *tk:st:* 'you took it off') and Moroccan Arabic (cf. Davis & Ragheb 2014: 17; Maas 2011: 34–5, who cites minimal pairs like *đaʁ* 'a house' vs. *đ:aʁ* 'the house', *ħaʒa* 'thing' vs. *ħaʒ:a* 'making a pelgrimage', *bən* 'son' vs. *bən:* 'tasty', and examples like *mud:a* 'time' and *lid:* 'the hand'), and from the Caucasus, like the Wixli dialect of the Lak language (cf. Anderson 1997: 989, who cites examples like *maqq* 'word', *kkunukk* 'egg', *ššaʕrultt* 'sparrows', *ttral* 'comb(ing)', *xxri* 'sea') and Tabasaran (cf. Xanmagomedov 1967: 550, who cites a minimal pair like *calik* 'on the wall' and *calikk* 'under the wall'; other examples include *kkurt* 'shirt', *javkkuv* 'to dig', *dekkju* 'bow', *mekk* 'ice', *jikk* 'bone').

The next question that we can now ask ourselves is: To what extent is this situation specifically Hittite? Or are there arguments to be given that we can project the Hittite stop system back to Proto-Anatolian?

5 The Proto-Anatolian stop system

Although e. g. Melchert (1994: 53) reconstructs the Proto-Anatolian stop system as one having two series that are distinct in voice (*/p, t, ḱ, k, kʷ/ vs. */b, d, ǵ, g, gʷ/), there are to my mind two arguments to be given that indicate that Proto-Anatolian rather possessed a stop system that is identical to the one we find in Hittite, namely one in which there are two series that are distinct not in voice, but in consonantal length instead. These arguments are the following:

1. It is commonly assumed that Proto-Anatolian had two environments in which fortis consonants became lenis, namely (1) after long accented vowels[31] and diphthongs, and (2) between two unaccented vowels in post-tonic position.[32] These so-called lenition rules have been established for Hittite, Cuneiform Luwian, Hieroglyphic Luwian, Lycian, and Palaic, and therefore must have been pan-Anatolian.[33] It is often assumed that the lenition caused by these two rules was a matter of 'voicing': e. g. Melchert (1994: 61) states that under these conditions "voiceless stops become voiced", and gives examples like PIE *$dʰéh_1ti$ > PAnat. "*$dǽdi$" > Lyc. *tadi* 'puts', or PIE *$mélit$- > PAnat. "*$mélid$-" > CLuw. *mallit*- 'honey'. But there is at least one word that has undergone a lenition that cannot be explained by voicing but that instead must have been a matter of shortening of an original long consonant. This word is *ḫāši* 'she gives birth' (belonging to the verb *ḫāš-ⁱ/ḫašš*-), which is commonly reconstructed as

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31 Which to my mind includes the outcome of PIE short *$ó$, on the basis of which I assume that at the Proto-Anatolian level this vowel had been lengthened to */ṓ/ (Kloekhorst 2008a: 65; 2014: 553–9).

32 First formulated by Eichner 1973: 79, 100[86] and Morpurgo Davies 1982–1983. See Kloekhorst 2014: 547–66 for a detailed treatment of these lenition rules.

33 In Proto-Anatolian, these cases of lenition probably were a purely phonetic phenomenon that had no phonological consequences yet. Only after the breaking up of Proto-Anatolian itself was the lenition of the consonants in these two positions phonemicized in the separate daughter languages (cf. Kloekhorst 2006: 134). For the sake of convenience, however, the Proto-Anatolian reconstructed lexemes that are cited in the remainder of this article will be given as if at the stage when these Anatolian lenition rules had already been phonologized.

$h_2$ómsei.[34] The normal outcome in Hittite of the intervocalic cluster *-ms-* is a long -*šš*-, as can be seen in e. g. *ḫaššu*- /hás:u-/ 'king' < *$h_2$émsu-. The only way to account for the presence of a short (lenis) -*š*- /s/ in *hāši* vis-à-vis the cluster *-ms-* of its preform is to assume that first the cluster *-ms-* assimilated to a long */s:/, and that in Proto-Anatolian times this long consonant underwent lenition, i. e. was shortened, because of the preceding long accented */ó̄/ (the PAnat. outcome of PIE *ó, cf. footnote 31): PIE *h_2ó**ms**ei > pre-PAnat. */hó̄**s**:ē/ > PAnat. */hó̄**s**ē/ > Hitt. *ḫāši* /há̄si/. Since the lenition that took place in pre-PAnat. */hó̄s:ē/ > PAnat. */hó̄sē/ cannot have anything to do with voicing,[35] but instead clearly must be interpreted as a matter of shortening, it seems legitimate to me to assume that all instances of Proto-Anatolian lenition were in fact cases of shortening instead of voicing, also when they affected stops. As a consequence, we must assume that at the Proto-Anatolian level the fortis stops were long voiceless stops, and that the resulting lenis stops were short voiceless stops: e. g. PIE *d^heh_1ti > pre-PAnat. */tét:i/ (in which initial */t/ corresponds to PIE *d^h, */é̄/ is the outcome of PIE *$éh_1$, and */t:/ corresponds to PIE *t) > PAnat. */téti/ (with a lenis, i. e. short /t/ that is the result of the lenition, i. e. shortening) > Lyc. *tadi* 'puts' (with a lenis *d*)[36]; and PIE *mélit-* > pre-PAnat. */mélit:-/ (with a fortis, i. e. long */t:/) > PAnat. */mélit-/ (with a lenis, i. e. short */t/ that is the result of the lenition, i. e. shortening) > CLuw. *mallit-* 'honey' (with lenis -*t*-).

2. Čop's Law describes the fact that after a short accented *é original short consonants end up being spelled as geminates in Cuneiform Luwian: *mélit-* > CLuw. *mallit-* 'honey'; *pérom* > CLuw. *parran* 'in front of'; etc.[37] In Kloekhorst 2006,[38] however, I argued that Čop's Law is valid not only after *é, but after all PAnat. accented short vowels,[39] which makes it stand in complementary distribution with the two lenition rules formulated for Proto-Anatolian, which affect consonants following a long accented vowel and an unaccented vowel, respectively. In other words, Čop's Law and the two lenition rules form a single system of accentually governed consonant gradation, cf. Tab. 1.

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34 Oettinger 1979: 113; Kloekhorst 2008a: 319–21. Note that Melchert 1994: 164 reconstructs the root of this verb as *$h_2$ens-*, but this does not affect the argument given here.

35 There is no indication whatsoever in Hittite that intervocalic lenis -*š*- was voiced.

36 Lyc. *d* (which in fact represents a fricative /θ/) is the regular outcome of PAnat. lenis */t/, cf. Kloekhorst 2008b: 125–6.

37 Čop 1970.

38 See now also Kloekhorst 2014: 567–86.

39 Including PAnat. */ó/ < PIE *[h_3]é (e. g. PIE *$h_3$éron- > PAnat. */hóron-/ > CLuw. *ḫarran(i)-* 'eagle'), but excluding PAnat. */ó̄/ < PIE *ó (e. g. PIE *dóru- > PAnat. */tó̄ru-/ > CLuw. *tāru-* 'wood').

Table 1. Consonant gradation in Luwian

PAnat.		CLuw.	
*V̆C(C)V	>	V̆CCV	(Čop's Law)
*V̆C(C)V	>	V́CV	(1st len. rule)
*V́CVC(C)V	>	V́CVCV	(2nd len. rule)

Čop's Law does not only affect resonants, but also other consonants, including stops, e. g. PIE *nébʰes > CLuw. *tappaš* 'heaven'. In the traditional view of Čop's Law it is assumed that, since PAnat. lenis stops are regarded to have been short voiced stops, the outcomes of Čop's Law in these cases were geminate voiced stops. E. g. Melchert (1994: 252–3) explicitly states that Čop's Law causes "*/b/ > /bb/", "*/d/ > /dd/", etc., and that these voiced geminate stops were therefore distinct from the original fortis stops (which Melchert writes as "/p/", "/t/", etc.). But it is problematic that in the orthography of Cuneiform Luwian no distinction is made between the two kinds of stops.[40] It therefore seems unattractive to me to assume that Čop's Law created a new series of stops that was distinct from the fortis one. And in fact, since we have seen that there are arguments to be made that point to a phonetic realization in Proto-Anatolian of fortis stops as voiceless long stops and lenis stops as voiceless short stops, it is to my mind evident that we must now view Čop's Law, which clearly deals with real lengthening (e. g. PAnat. */pérom/ > CLuw. *parran*, with /r:/), as turning original lenis, i. e. voiceless short stops (e. g. PAnat. */p/ as in */népe/os-/ ∼ PIE *nébʰe/os-*) into fortis, i. e. voiceless long stops (CLuw. */p:/ as in *tappaš*-/táp:as-/ 'heaven').

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40 Rieken & Yakubovich (2010: 210) claim that the Hieroglyphic Luwian word ("LOCUS")*pa̢-tà-za* (ÇİNEKÖY §10) 'places', which derives from PIE *pédo-*, should be phonologically analysed as /padda-/, with a /dd/ that is the result of PIE *d affected by Čop's Law (Rieken 2008: 643 still hesitated between "/pada-/ oder /padda-/"). Since this /dd/ would then be spelled by the sign *tà* whereas fortis dental stops in HLuw. are spelled with the sign *ta* (Rieken 2008), this interpretation would mean that in HLuw. there was an orthographic distinction between original fortis stops and the outcome of lenis stops affected by Čop's Law. Yet as I have argued in Kloekhorst 2014: 579–80, Rieken & Yakubovich's analysis of *pa-tà-za* can be improved: since the *e of the preform was lengthened already in pre-PAnatolian because of the following voiced (i. e. pre-glottalized) stop *d = *[ˀt], this word had become */p:éta-/ in Proto-Anatolian, with a long accented */é/, and therefore remained unaffected by Čop's Law. The use of the sign *tà* in *pa-tà-za* thus denotes the presence of a normal, unaffected lenis stop (cf. Rieken 2008 for the interpretation of *tà* as denoting the HLuw. lenis dental stop).

On the basis of these considerations I assume that Proto-Anatolian, just as Hittite, had two series of stops which were distinct in consonantal length, and not in voice: fortis /pː, tː, Ḱː, kː, kʷː/ vs. lenis /p, t, Ḱ, k, kʷ/.

6 The pre-Proto-Anatolian stop system

As I have argued elsewhere in detail, there are several arguments for assuming that pre-Proto-Anatolian had a series of pre-glottalized lenis stops, which correspond to the stops that for Proto-Indo-European usually are reconstructed as voiced. These arguments are the following:

1. In Hittite there is a phonemic distinction between two types of long accented /ā́/. In open syllables, the first one, which I have called "/ā́$_1$/", shows a significant phonetic shortening after the Middle Hittite period, whereas the second one, "/ā́$_2$/", does not. The former, /ā́$_1$/, derives from PIE *$ó$, *[h_3]$é$, *$éh_3$, and *$éh_2$, whereas the latter derives from PIE *$óH$ (e. g. /lā́$_2$ueni/ < *$lóh_1$$ueni$ 'we let') and from PIE *$ó$ followed by a voiced stop (but crucially not an aspirated voiced stop): Hitt. *ua-a-tar* /uā́$_2$tər/ < PIE *$uódr$ 'water'. In other words, the PIE sequence *$óD$ yields in Anatolian the same outcome as the PIE sequence *$óHC$, which differs, however, from the outcome of *$óC$ (in which C = any consonant except voiced stops). Since the sequence *$óD$ does not behave as other sequences of the shape *$óC$, but instead yields the same result as the sequence *$óHC$, it is likely that the PAnat. pendant to the PIE voiced stop had a phonetic property preceding its buccal part that is comparable to the PAnat. outcome of *H in the sequence *$óHC$. Since this outcome is a glottal stop, */ʔ/,[41] it is likely that the phonetic property of the stop in question was pre-glottalization.[42]

2. In Old Hittite there is a phonemic distinction between short accented /é/ and long accented */ḗ/. The former derives from PIE short accented *$é$, whereas the latter derives from PIE *$ḗ$, *$éh_1$ and the monophthongization products of *$éi$ and *$ói$. There is one environment where PIE short accented *$é$ yields an OH long accented /ḗ/, however, namely when it is followed by an etymological plain voiced stop (but crucially not an aspirated voiced stop): PIE *$pédom$ > OH /pːḗtan/ 'place', PIE *$nég^umo$- > OH /nḗkʷmant-/ 'naked', etc. We see that the PIE sequence *$éD$ does not behave the same as other sequences of the shape *$éC$, but instead yields exactly the same result as the sequence *$éh_1C$.

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41 Cf. Kloekhorst 2008a: 77.
42 Cf. Kloekhorst 2014: 405–14 for a full account of this argument.

This suggests again that the *D had a phonetic property preceding its buccal part that is comparable to *h_1. Since *h_1 is often assumed to have been a glottal stop, */ʔ/,[43] it is likely that this phonetic property was pre-glottalization.[44]

3. When standing after *n, the PIE phonemes *t and *d^h, through pre-Hittite */t:/ and */t/, respectively, yield a sequence that in Old Hittite is spelled °n-TV as well as °n-DV, and that therefore phonetically must have been [ndV]. In other words, the pre-Hittite voiceless stops */t:/ and */t/ merged and underwent voice assimilation after *n. The PIE phoneme *d, however, which in a pre-stage of Hittite must have been a voiceless short stop as well, yields when standing after *n an Old Hittite sequence that is consistently spelled °n-TV, and that therefore phonetically must have been [ntV]. This means that this consonant apparently did not undergo any voice assimilation. The only way in which it is understandable that PIE *t and *d^h (i. e. pre-Hitt. */t:/ and */t/, respectively) did undergo a voice assimilation to the preceding n, whereas PIE *d, which in other contexts has fully merged with PIE *d^h into /t/, did not, is to assume that this latter phoneme contained a phonetic feature preceding its buccal part that blocked the assimilation. Since in similar clusters the phoneme *h_1 = *[ʔ] also blocks assimilations,[45] it is again likely that this feature was pre-glottalization.[46]

On the basis of these three arguments it can be argued that the stops corresponding to the stops that for PIE are usually reconstructed as voiced, must at some stage in the prehistory of Hittite have been pre-glottalized voiceless short stops: */ʔp, ʔt, etc./. This stage can be dated back to at least pre-Proto-Anatolian on the basis of the following argument.

4. Elsewhere[47] I have argued that, although Čop's Law affects PIE voiced aspirated stops (e. g. PIE *$méd^hu$- > CLuw. *maddu*- 'wine'), it does not affect PIE

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43 E. g. Beekes 1995: 126 ("*h_1 = ʔ"); Clackson 2007: 57 ("Current consensus tends to give *h_1 the value of a glottal stop"); Fortson 2004: 58 ("one fairly widespread view has it that *h_1 was a simple *h* or a glottal stop [ʔ]"). Some scholars assume that *h_1 was in fact a [h], however, cf. Fortson as just mentioned and Meier-Brügger 2002: 106.

44 Cf. Kloekhorst 2012: 258–9 and Kloekhorst 2014: 230–5 for a full account of this argument.

45 Cf. the development of *$VnsV$ > Hitt. *VššV* vs. *Vnh_1sV > Hitt. *VnzV* (Kloekhorst 2008a: 87–8).

46 Cf. Kloekhorst 2013: 131–9 for a full account of this argument. An anonymous reviewer has expressed doubts against my postulation of pre-PAnat. */Vnʔtv/ (corresponding to PIE *$VndV$) > Hitt. [VntV] because "cross-linguistically, it is odd for pre-glottalized segments to occur in onsets (vs. codas), cf. English for example". Yet, Roach (1973: 15) states that in some dialects of English a word like *computation* is pronounced [ˌkɒmʔpjʊˈteɪʃn̩], in which the pre-glottalized [ʔp] stands in onset. I therefore see no problems in assuming sequences like */Vnʔtv/ for pre-Proto-Anatolian.

47 Cf. Kloekhorst 2014: 574–83 for the full argument.

voiced stops (e. g. PIE *$h_1éduno$ > CLuw. *aduna* 'to eat', not ****adduna* or ****attuna*). Since Čop's Law is conditioned by a preceding short accented vowel, we must assume that in the latter example the vowel preceding *d apparently was not short, and therefore must have been long: PAnat. */ʔḗtuno/. Etymologically, however, we would expect the verbal root in such formations to be in *e*-grade: PIE *$h_1éduno$. In other words, the short *e of the PIE form must have been lengthened to PAnat. */ē/. We see here the same development as in Hittite /pːḗta-/ < PIE *$pédo$-, etc.: an original short vowel is lengthened when standing in front of an etymological plain voiced stop. Since this lengthening is shared by Hittite and Luwian, we can assume that it had been effectuated in Proto-Anatolian times already. This automatically means that its cause, which on the basis of the Hittite evidence was identified as the pre-glottalization of the stop corresponding to the PIE plain voiced stop, must have been present as such in pre-Proto-Anatolian times already.

All in all, my reconstruction of the pre-Proto-Anatolian stop system is one of three series, namely one of voiceless long stops, one of pre-glottalized voiceless short stops, and one of plain voiceless short stops, corresponding to the PIE stops in the way shown in Tab. 2 (exemplified by the row of dental stops).

Table 2. The pre PAnatolian stop system

pre-PAnat.	PIE
*/tː/	*t
*/ʔt/	*d
*/t/	*d^h

The question now is: how do these two systems relate to each other? Before we can answer this question, we must embark on a theoretical digression, however.

7 The 'Indo-Hittite' hypothesis

When in 1915 Hittite was first deciphered and recognized as an Indo-European language,[48] it soon became clear that there was something odd going on. On the one hand, Hittite turned out to be a very archaic language that in some of its

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48 Hrozný 1915.

parts resembled the Proto-Indo-European mother language (as it had at that time been reconstructed on the basis of Sanskrit, Greek, etc.) more than any other Indo-European language. Yet there were also parts of the language where Hittite turned out to be radically different. For instance, it lacked several important linguistic categories that were thought to be core features of Proto-Indo-European, such as the feminine gender and the verbal categories aorist and perfect. In order to account for these strange facts, Forrer (1921) was the first to formulate the hypothesis that Hittite should not be viewed as a daughter of the Proto-Indo-European mother language, but rather as its sister, which means that both would derive from an even earlier proto-stage, which was coined 'Indo-Hittite' by Sturtevant (1933: 30). For a long time, this idea was generally viewed as too radical. It was instead assumed that the aberrant character of Hittite as well as its Anatolian sister languages was due to a massive loss of categories and to other specific innovations within the Anatolian branch. It was therefore thought that there was no need to assume that the Anatolian branch had a special status within the Indo-European language family and that there therefore was no reason to alter the 'classic' picture of the Proto-Indo-European mother language. Yet, in the last few decades this viewpoint has shifted, and nowadays the majority of scholars seem to support the hypothesis that Anatolian did split off first from the mother language, and that the other branches at that point in time still formed a single language community that underwent some common innovations that Anatolian did not share.[49] This does not mean, however, that there is at the moment any broad consensus on the number or nature of these common innovations. In fact, the debate about the exact relationship between Anatolian and the other Indo-European branches is presently one of the most exciting topics within Indo-European linguistics.

The theoretical implications of the possibility that Anatolian was the first to split off from the mother language are far-reaching. It means that for each linguistic feature in which Anatolian deviates from the other IE branches, it has now become theoretically possible that it is not the result of an innovation of the Anatolian branch, but that Anatolian in fact has retained the original situation whereas the other branches have undergone a shared innovation.

In the following, I want to discuss this possibility with regard to the stop system. For the sake of clarity, in the following I will use the term 'classic Proto-Indo-European' to refer to the mother language of all the Indo-European branches other than Anatolian, and the term 'Proto-Indo-Hittite' for the theoretical mother

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49 Kloekhorst 2008a: 7–11; Oettinger 2013–2014; Melchert forthc. Cf. Rieken 2009 for a more cautious view.

language from which both Proto-Anatolian and classic Proto-Indo-European would have sprung.

# 8 A comparison between the pre-PAnat. and the PIE stop system

Within the traditional view on the relationship between Anatolian and the rest of the IE family, Anatolian is just one of the daughters of PIE, which means that the pre-PAnat. stop system should derive from the classic Proto-Indo-European one in the following way:

(a)

classic PIE		pre-PAnat.
*t	>	*/t:/
*d	>	*/ˀt/
*dʰ	>	*/t/

If, however, this traditional view needs to be abandoned and should be replaced by the Indo-Hittite hypothesis (regardless of how large one regards the gap between Anatolian and the rest of the family), we would have to take into account the following three theoretically possible scenarios that describe the relationship between the Anatolian and the classic PIE stop system.

1. The first scenario that is theoretically possible is that the Proto-Indo-Hittite stop system is identical to the classic PIE one, and that the pre-PAnat. system derives from it, which amounts to saying that classic PIE has preserved the original situation, whereas Anatolian has undergone an innovation. Since this scenario is in practice identical to the traditional view as cited under (a), I will call this scenario (a'):

(a')

PIH: *t, *d, *dʰ

classic PIE: *t, *d, *dʰ (no change)

innovation → pre-PAnat.: */t:/, */ˀt/, */t/
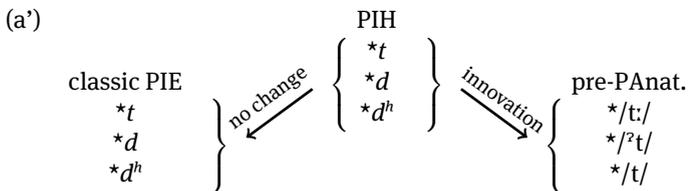
2. The second scenario that is theoretically possible, however, is that the PIH stop system is identical to the pre-PAnat. one, and that the classic PIE system derives from it, which would mean that Anatolian has preserved the original situation, whereas classic PIE has undergone an innovation. I will call this scenario (b):

(b)
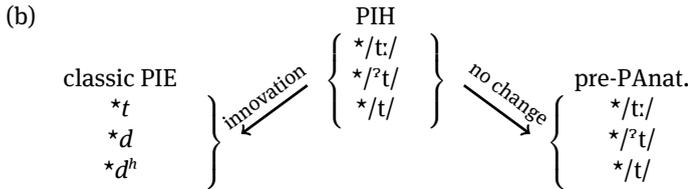
3. A third scenario that is theoretically possible is of course that the PIH stop system was different from both the classic PIE and the pre-PAnat. one, which would mean that both would show an innovation vis-à-vis the original situation. I will call this scenario (c):

(c)
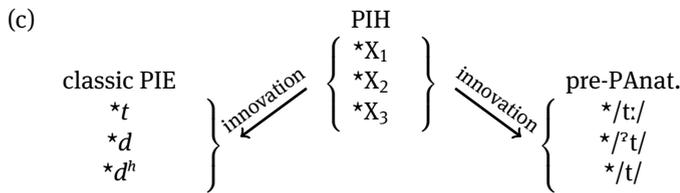
   Yet, without additional evidence, like a third comparandum, this scenario is not easy to prove, and I will therefore leave it out of consideration in the remainder of this article.

As was already mentioned, scenarios (a) and (a') are equivalent to each other in the sense that in both cases it would be the system */t:/, */ˀt/, */t/ that derives from the system *t, *d, *dʰ. From now on, I will therefore treat them as one scenario, called (a). Scenario (b) forms the opposite to scenario (a), in the sense that it is now the system *t, *d, *dʰ that derives from */t:/, */ˀt/, */t/.

   In the following, I will discuss whether arguments can be found on the basis of which it can be decided whether one of these two scenarios, (a) or (b), should be regarded as more probable than the other. Note that since scenario (b) is specifically tied to the Indo-Hittite hypothesis, an outcome according to which scenario (b) should be regarded as more probable than scenario (a) would automatically form an argument in favor of this hypothesis. If, however, it would turn out that

scenario (a) is the more probable one, then nothing can be said about the position of Anatolian in the IE language family, since this scenario fits both the traditional view and the Indo-Hittite hypothesis.

9 Remarks on the reconstruction of the classic PIE stop system

In most handbooks on IE linguistics it is stated that PIE had three series of stops, namely a voiceless one, a voiced one, and a voiced aspirated one: *t, *d, *dʰ. This does not mean, however, that this traditional reconstruction has never been challenged. In fact, since the 1960s several scholars have proposed alternative reconstructions, of which the so-called 'glottalic' models are the most prominent ones. These state that the series that in the traditional reconstruction is assumed to have been a plain voiced stop in fact was glottalized (either post-glottalized (ejective) or pre-glottalized, depending on the specific model).

Although the present-day common opinion seems to be against these glottalic theories, there are many arguments[50] in favor of them. First, there are a number of typological arguments:[51]

1. The stop system traditionally reconstructed for Proto-Indo-European, namely as having a three-way distinction between voiceless, voiced, and voiced aspirated (= breathy voiced) stops, is unattested in any other known language, whereas three-way systems including glottalized stops are commonplace.[52]
2. There is a constraint in PIE against roots containing two voiced stops. If these stops were really voiced stops, this constraint would be unaccounted for. However, if they were in fact glottalized stops, this constraint is much more understandable, since it can then be explained as having been caused by a dissimilation of glottalization.[53]

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50 See also Kortlandt 1985.

51 Cf. Bomhard (forthcoming) for an excellent overview of the history of the glottalic theories.

52 Jakobson 1958: 22f; Hopper 1973: 141. It is sometimes claimed that Kelabit (a language spoken on Borneo) provides a parallel for the stop system as reconstructed for PIE. Yet although Kelabit indeed has a voiceless and a voiced series that is comparable to the series as reconstructed for PIE, its series of so-called 'voiced aspirates' in fact consists of geminates starting with a voiced onset and ending as voiceless aspirates, e. g. [dtʰ] (Blust 1974; 2006), which are phonetically totally different from the 'voiced aspirates' as reconstructed for PIE, which are usually thought to have been breathy voiced stops, e. g. [d̤]. I therefore do not consider Kelabit as evidence for solving the typologically problematic character of the traditional reconstruction of the PIE stop system.

53 Gamkrelidze & Ivanov 1973: 153.

3. The phoneme *b is rare, perhaps even fully absent, in the lexicon reconstructed for PIE. Such a gap in the system would be odd if *b was a voiced stop.[54] However, in systems with glottalized consonants it is often the glottalized labial that is absent.[55]

Apart from these typological considerations, in the last few decades more and more arguments of a comparative nature have been brought forth that support a glottalic, and more specifically a pre-glottalic, interpretation of the series traditionally reconstructed as voiced. These arguments are:[56]

4. Winter's Law in Balto-Slavic,[57]
5. Lachmann's Law in Latin,[58]
6. the presence of pre-glottalization, pre-aspiration and tonal features in several Germanic languages,[59]
7. the presence of pre-glottalized stops in Sindhi,[60]
8. the alternation of PIE *d with *h_1 in a number of PIE lexemes,[61]
9. Lubotsky's Law in Indo-Iranian,[62]
10. the distribution of Sanskrit *na*-participles,[63]

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54 Pedersen 1951: 10–6.

55 Martinet 1953: 70.

56 See also Kortlandt 2012.

57 Kortlandt 1988a. Winter's Law states that in Balto-Slavic vowels receive the acute intonation before PIE voiced stops, just as they do before PIE laryngeals, whereas before PIE voiceless and voiced aspirated stops they do not. Some scholars claim that the acute intonation derives from earlier lengthening, and that Winter's Law therefore can be explained as vowel lengthening before PIE voiced stops, but not before PIE voiced aspirated stops (e. g. Kümmel 2012: 299, with references). But since PIE long vowels (*$\bar{e}$ and *$\bar{o}$) do not receive the acute intonation (Kortlandt 1975: 21f. 1985; Villanueva Svensson 2011, who restricts this rule to long vowels in word-final position and in monosyllables), it is clear that acute intonation cannot be equated with vowel length. It is therefore nowadays quite generally assumed that the acute intonation equals glottalization (Young 1994; Jasanoff 2004a: 251; Matasović 2005: 152; Olander 2009: 14; Pronk 2012: 207–9). In the case of laryngeals causing glottalization, this can be understood by assuming that the laryngeals merged into a glottal stop that was reanalyzed as glottalization of the preceding vowel. In the case of PIE voiced stops causing glottalization, this is best explained by assuming that the voiced stops in fact contained a pre-glottalic feature which, just like the laryngeals, was also reanalyzed as a glottalic feature of the preceding vowel.

58 Kortlandt 1989; 1999; Sukač 2012. For a different interpretation of Lachmann's Law, cf. Jasanoff 2004b.

59 Kortlandt 1988b; 2000; 2007; but cf. Kümmel 2012: 301 (with references) for criticism.

60 Kortlandt 1981, but cf. Kümmel 2012: 300 for criticism.

61 Kortlandt 1983; Lubotsky 1994; 2013; Garnier 2014.

62 Lubotsky 1981.

63 Lubotsky 2007.

11. the presence of glottalized stops in Armenian,[64]
12. the accentological outcomes of certain West-Germanic loanwords in Slavic.[65]

Since the evidence for a pre-glottalic interpretation of the series traditionally called 'voiced' is abundant, we can set up this series as pre-glottalized voiced stops: [ʔd]. This has as a consequence that the series traditionally called 'voiced aspirates', $*d^h$ (nowadays more and more called 'breathy voiced', *[d̤]), would be doubly marked. Within the pre-glottalic theory, this series can therefore be set up as plain voiced, *[d].[66] On this basis, we can reconstruct the following stop system for classic PIE: *[t], *[ʔd], *[d] (corresponding to traditional $*t$, $*d$, $*d^h$, respectively).[67] It should be noted however, that this interpretation of the classic PIE stop system is not crucial

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64 Kortlandt 1998, but cf. Kümmel 2012: 299–300 (with references) for an alternative interpretation of the Armenian stop system.

65 Pronk-Tiethoff 2013: 271–3.

66 As is its outcome in Iranian, Slavic, Baltic, Armenian, Albanian, Celtic and Germanic. Different outcomes can only be found in Sanskrit (where it yielded *dh* [d̤], cf. footnote 66), in Latin (where it yielded *[ð], a phonetically trivial development), in Greek (where it yielded [tʰ], cf. footnote 67), and in Tocharian (where it yielded [t], but cf. footnote 76).

67 Weiss (2009b) and, independently, Kümmel (2012: 303–6) have argued that pre-PIE may have had a system *[t], *[ɗ], *[d], i. e. with a voiceless, an implosive, and a voiced series, that later on developed into the system *[t], *[d], *[d̤], with a voiceless, a voiced, and a breathy voiced series, respectively. Weiss calls this development the "Cao Bang shift" since it also seems to have occurred in the prehistory of Cao Bang, a northern Thai language (which significantly also possesses a fourth series, namely of voiceless aspirates, [tʰ], and therefore shows the same stop system as Sanskrit). It should be remarked that the system *[t], *[ɗ], *[d] is virtually identical to the pre-glottalic model *[t], *[ʔd], *[d] since, as Greenberg (1970: 124) notes, implosives and pre-glottalized consonants "have to be considered as variants of the same basic type" and in some languages they stand in free variation e. g. in Chrau, a Mon-Khmer language from Vietnam (Thomas 1962: 186–7), and in Kambari, a language from Nigeria (Ladefoged 1968: 60). Moreover, although Weiss explicitly states that he assumes that the development of the 'implosive' system *[t], *[ɗ], *[d] to the 'breathy voiced' system *[t], *[d], *[d̤], took place in pre-PIE, implying that he regards the traditional system to be the origin of the consonant systems of all IE languages, Kümmel (2012: 304) is more cautious, stating: "It should be borne in mind that there is no evidence for breathy voice in Anatolian, Celtic, and Balto-Slavic, and, seemingly, the languages from Messapian to Phrygian – i. e., in some rather peripheral languages. Could this point to a central IE innovation that spread to most, but not all, dialects?". This comes close to the view advocated here, namely that classic PIE had a system with a voiceless, a pre-glottalized voiced, and a plain voiced series, *[t], *[ʔd], *[d], and that only in Sanskrit, and possibly in Greek, the "Cao Bang shift" has taken place in which *[d] developed into *[d̤], and *[ʔd] (corresponding to the implosive *[ɗ] of Weiss' and Kümmel's system) into *[d]. In Sanskrit the emergence of *[d̤] was triggered by the emergence of [tʰ] < *tH, yielding a stabile system [t], [tʰ], [d], [d̤]. In Greek, however, the "Cao Bang Shift" yielded the unstable system *[t], *[d], *[d̤], which was solved by devoicing of the *[d̤] to [tʰ].

for the argumentation that will be given here. In the paragraphs to follow I will therefore treat both the traditional and the pre-glottalic interpretation.

10 Deciding between two scenarios

As we have seen above, in paragraph 8, there are theoretically two scenarios to explain the relationship between the classic PIE stop system (*t*, *d*, *dʰ* = *[t], *[ˀd], *[d]) and the pre-PAnat. one (*/t:/, */ˀt/, */t/). In the first scenario, (a), the latter system is derived from the former, whereas in the second one, (b), the former is derived from the latter:

(a)

*t	(= *[t])	>	*/t:/
*d	(= *[ˀd])	>	*/ˀt/
*dʰ	(= *[d])	>	*/t/

(b)

*/t:/	>	*t	(= *[t])
*/ˀt/	>	*d	(= *[ˀd])
*/t/	>	*dʰ	(= *[d])

I will compare these two scenarios by discussing from a typological point of view the phonetic developments they presuppose.

The first scenario, (a), basically operates with the following two phonetic developments:

(1) The two voiced stops, *[ˀd] and *[d], have been devoiced to */ˀt/ and */t/, respectively.[68]

(2) The voiceless stop, *[t], has been lengthened/geminated to */t:/.

Although the first development, a devoicing of *[ˀd] to */ˀt/ and of *[d] to */t/, is a trivial one,[69] the second one is not: spontaneous, unconditioned lengthening/gemination of original short stops is a development that, as far as I know, is

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68 If one adheres to the traditional reconstruction of PIE, this should be rephrased as: *d* was devoiced and received pre-glottalization, yielding */ˀt/, whereas *dʰ* = *[d̰] lost its breathiness and its voice, yielding */t/.

69 Note that within the traditional reconstruction of PIE, the developments PIE *d* = *[d] > pre-PAnat. */ˀt/ and PIE *dʰ* = *[d̰] > pre-PAnat. */t/ are typologically far less trivial. The former implies a spontaneous unconditioned pre-glottalization, which is cross-linguistically attested for word-final position (Kümmel 2007: 187), but is much rarer in other positions (the example of British English that Kümmel 2007: 188 cites is debated). The latter implies a devoicing combined with deaspiration of the breathy voiced stops, whereas devoicing of such stops normally has voiceless aspirates as a result (Kümmel 2007: 144).

cross-linguistically unattested. In his book on consonant changes, Kümmel (2007: 176–82) gives many examples of gemination at the syllable boundary, gemination in the case of palatalisation, gemination as the result of compensatory lengthening, and gemination due to "Quantitätsumlegungen", but for spontaneous, unconditioned gemination of stops Kümmel gives only one example, namely the development of PIE *p, *t, etc. to Anat. */p:/, */t:/, etc., which is exactly the development under review. In a study on the emergence of geminates, Blevins (2004: 175) states that since "[i]n many languages voiceless obstruents are significantly longer than their voiced counterparts", "we might expect to find" that an original voicing contrast was reinterpreted as a length contrast: T : D > TT : T. Yet she must admit that she has been "unable to find well-documented cases involving inherited vocabulary" (2004: 176). She does refer to Emenau (1967: 372), however, who reconstructs a voiceless : voiced contrast for Proto-Dravidian (as found in many Dravidian languages), which in Tamil and Malayalam would have developed into a geminate : singleton contrast. Yet, as Blevins remarks herself (referring to Steever 1998: 14–7), it has become clear since Emeneau that the length contrast of Tamil and Malayalam is original and should be reconstructed for Proto-Dravidian, whereas the voice contrast as found in the other Dravidian languages is due to an innovation. This means that cross-linguistically there is not a single language known for which a reinterpretation of an original voice contrast to one in length is attested, which means that the alleged development of PIE *t : *d$^{(h)}$ > Anat./ Hitt. /t:/ : /t/ is simply unparalleled.[70] In other words, scenario (a) operates with a

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70 Note that Melchert's reference to the "situation in Old Tamil (and Proto-Dravidian), as described by Zvelebil (1970: 82f), where an underlying voiceless vs. voiced contrast is realized as geminate vs. simple in intervocalic position" (Melchert 1994: 18), must be based on a misunderstanding: Zvelebil never stated anything like that. Instead, Zvelebil (1970: 82–3) explains that pre-Proto-Dravidian originally knew only one series of stops, which were short, voiceless, and tense in initial position, but, allophonically, short, voiced, and lax in intervocalic position. Only when in intervocalic position did voiceless, tense geminates arise due to the assimilation of original clusters, which yielded the Proto-Dravidian phonological system that is the ancestor to the systems as found in Tamil and Malayalam, where we find an opposition between single consonants (which are voiceless and tense when word-initial but voiced and lax when intervocalic) and geminate consonants (which only occur in intervocalic position and are always voiceless and tense). In other words, the emergence of the geminate : singleton contrast in Dravidian has nothing to do with a reinterpretation of an original contrast in voiceless short stops vs. voiced short stops, and therefore cannot be used as a parallel for the alleged development of the Anatolian stop system out of the classic PIE one. Melchert's mentioning of "the treatment of Germanic loanwords in Finnish", which shows that "a contrast of voiceless vs. voiced stops may be reinterpreted as long vs. short" (Melchert 1994: 18), is irrelevant for the present question since, as Melchert notes himself, "[t]his is, of course, a case of sound substitution". One could perhaps argue that such a

development that has not (yet) been found in any other language, and therefore is typologically weak.

The second scenario, (b), basically operates with the following two phonetic developments:

(1) The two voiceless short stops, */ʔt/ and */t/, were voiced to *[ʔd] and *[d], respectively.[71]

(2) The voiceless long stop */t:/ was shortened/degeminated to */t/.

Both developments are trivial in the sense that voicing as well as shortening/degemination can be observed in the histories of many languages (Kümmel 2007: 42–54, 133–5). Moreover, the two developments can easily be seen as interconnected through a pull-chain: at the moment that */ʔt/ and */t/ underwent voicing, for instance in intervocalic position (a trivial case of lenition), the length of */t:/ would have become superfluous and would therefore have been automatically removed, after which the new phonetic realizations of these phonemes would have been extended to all positions in the word.

As we see, scenario (a) operates with two phonetic developments, one of which is typologically unattested and therefore highly suspicious, whereas scenario (b) operates with two phonetic developments that are both typologically common, and that can even be viewed as forming a single chain of sound change. From a cross-linguistic point of view, scenario (b) is therefore clearly to be preferred over scenario (a).

This conclusion is of major importance, since it would form a new argument in favor of the Indo-Hittite hypothesis. However, although typological considerations are important as a heuristic device, they are difficult to use as definite proof. We therefore need to look for additional evidence that can help us decide between scenario (a) and (b).

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substitution of PIE *t, *d, *dʰ (*[t], *[ʔd], *[d]) by pre-PAnatolian */t:/, */ʔt/, /t/ could have been caused by intensive contact with or substratum influence by a language having such a contrast in consonantal length, but then I would expect a much heavier influence also in the area of morphology and the basic lexicon. Since especially the morphology of the Anatolian languages is in many aspects very archaic (for instance in its retention of accentual mobility in nominal and verbal paradigms, an area in which other archaic IE languages like Sanskrit and Greek have undergone much more innovations than Hittite has), I do not see a good reason to assume such intensive language contact or substratum influence.

71 If one adheres to the traditional reconstruction of PIE, this should be rephrased as: */ʔt/ was voiced and lost its pre-glottalization, yielding *d, and */t/ was voiced and received breathiness, yielding *dʰ = *[d̠]. This is in fact the "Cao Bang shift" as described in footnote 67.

11 Additional evidence in favor of scenario (b)

The 2sg.pres. form of the verb 'to be' is generally reconstructed as PIE *$h_1ési$, with a single *s, on the basis of Skt. *ási*, Gr. εἶ, etc. However, since this word is to be analyzed morphologically as a form of the verbal root *h_1es- 'to be' to which the 2sg. ending *-*si* is attached, we would in fact expect it to have been *$h_1éssi$, with a geminate *ss. It is therefore commonly assumed that at a certain point in the prehistory of PIE the geminate *ss was simplified to *s, a development that is usually seen as the result of a larger tendency of degemination in the prehistory of PIE.[72] Diagrammatically:

pre-PIE *$h_1éssi$

degemination

PIE *$h_1ési$

Skt. *ási*   Gr. εῖ   etc.
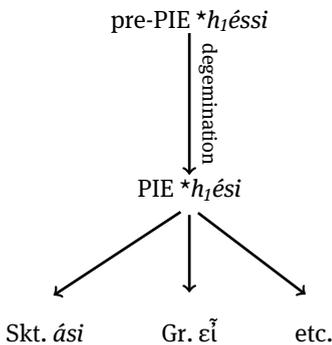
This brings about the interesting question as to the extent to which it is possible to equate the degemination in pre-PIE *$h_1éssi$ > PIE *$h_1ési$ with the shortening/degemination of original long/geminate stops that is assumed in scenario (b).
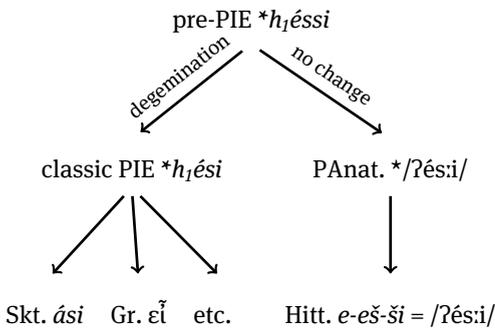
As we have seen, scenario (b) is tied to the Indo-Hittite hypothesis in the sense that it assumes that Proto-Indo-Hittite had the same stop system as pre-Proto-Anatolian, and that the classic PIE stop system results from it through an innovation, namely the voicing of short voiceless stops and the shortening of long stops. If the degemination of *ss as seen in *$h_1éssi$ > *$h_1ési$ were to be equated with the shortening/degemination of long/geminate stops that in scenario (b) is assumed to have taken place at some stage between Proto-Indo-Hittite and classic Proto-Indo-European, it would follow that Proto-Indo-Hittite would equal the pre-PIE stage in which the 2sg. form of 'to be' was still *$h_1éssi$, with a geminate *ss. Since in scenario (b) it is assumed that in the development of Proto-Indo-Hittite

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72 Tichy 2000: 27; Meier-Brügger 2002: 105 ("Die uridg. Regel der Geminaten-Vereinfachung betrifft in der Praxis vor allem uridg. *s"); Fortson 2004: 63; Weiss 2009a: 425 ("geminates were simplified in Proto-Indo-European").

to Proto-Anatolian no shortening/degemination took place, this would predict that the PIH form *$h_1$éssi*, with a geminate **ss*, should have remained unaltered in Anatolian.

When we now go looking for Anatolian cognates of Skt. *ási*, Gr. εἶ, etc., this prediction proves to be correct. The Hittite form for 'you are' is in fact spelled *e-eš-ši*,[73] with a geminate spelling of the -*šš*-, which unequivocally points to the presence of a long/geminate /s:/: /ʔés:i/. This form must therefore go back to PAnat. */ʔés:i/,[74] which is exactly the form that we would expect to derive from the hypothetical PIH form *$h_1$éssi*.

In other words, the commonly accepted prehistory of the PIE form 'you are', namely that it derives from a pre-PIE form *$h_1$éssi* that in a pre-stage of PIE has undergone a degemination that yielded the classic PIE form *$h_1$ési* that is the ancestor to Skt. *ási*, Gr. εἶ, etc., perfectly fits the Indo-Hittite hypothesis, in the sense that the Hittite form of 'you are', *e-eš-ši* = /ʔés:i/, seems to stem directly from this pre-PIE form *$h_1$éssi*, and not from the classic PIE form *$h_1$ési*. We may therefore now assume that the form *$h_1$éssi* belonged to the PIH stage, as visualized in the following diagram:

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                    pre-PIE *h₁éssi
              degemination      no change

    classic PIE *h₁ési          PAnat. */ʔés:i/


  Skt. ási   Gr. εἶ   etc.      Hitt. e-eš-ši = /ʔés:i/
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This model perfectly fits scenario (b) as presented above, in the sense that there, too, a shortening/degemination was postulated between the PIH and the classic PIE stage that did not occur in the development of PIH to PAnat. The two models thus mutually support each other, and I therefore regard the case of *$h_1$éssi* as a very likely candidate for forming the additional comparative evidence that we

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73 Attested in KUB 31.143a + VBoT 124 iii 8 (OS).

74 Of course, it cannot be fully excluded that Hitt. *e-eš-ši* /ʔés:i/ derives from an earlier */ʔési/, in which the 2sg.pres. ending */-si/ was restored (much like the Greek form ἐσσί (e. g. Iliad A 176) vis-à-vis normal εἶ). Yet, since it is precisely the verb 'to be' that in all IE languages shows the strongest resistance against morphological regularizations, this does not seem likely to me.

need for supporting the typological considerations that point to scenario (b) as the most likely one of the two scenarios discussed above.[75]

12 Conclusions

We can conclude that of the two scenarios sketched above to describe the relationship between the pre-Proto-Anatolian and the classic Proto-Indo-European stop systems, (a) and (b), it is the latter one, scenario (b), that is to be preferred. First, scenario (b) assumes a set of interrelated sound changes that is typologically trivial, whereas scenario (a) presupposes a sound change that is cross-linguistically unattested. This makes scenario (b) superior when compared to scenario (a) on typological grounds. Second, there is additional comparative evidence that seems to point to the validity of scenario (b), namely the existence of Hitt. *e-eš-ši* /ʔésːi/ 'you are' with a geminate *-šš-*, which may now be seen as the unaltered reflex of the PIH 2sg. form *$h_1$éssi*, which in classic PIE had undergone a degemination to *$h_1$ési*, yielding reflexes like Skt. *ási*, Gr. εῖ, etc.

Since scenario (b) is specifically tied to the Indo-Hittite hypothesis, the conclusions of this paper form an important additional argument in favor of the view that Anatolian was the first branch to split off from the mother language, which in this paper has been called "Proto-Indo-Hittite", and that the other

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75 An anonymous reviewer raises the question how the pre-PIE rule of shortening/degemination as advocated here can be reconciled with several lexemes containing geminates that Byrd (2010: 19) has reconstructed for PIE, namely "*atta* 'daddy', *kakka* 'poo-poo', *akka* 'momma', and *anna* 'momma'". To my mind, none of these reconstructions can be taken seriously. For instance, Byrd reconstructs *kakka* on the basis of Gr. κακκάω, MIr. *caccaim*, Russ. *kákat'* 'to shit', but does not explain why the Russian form is not **kok-*, as we would expect from a PIE form *kakka*. Moreover, he does not mention e. g. Germ. *kacken* 'to shit' and Arm. *kʻakor* 'dung', which clearly belong to the same group of words but are phonologically irregular (we would expect *kakka* to have yielded Germ. **hahh-* and Arm. **kʻakʻ-*). Furthermore, we find the same word in other language families as well, e. g. Turkish *kaka* 'poo-poo'. It is therefore clear that we are dealing here with a word from children's language that can have counterparts in different languages that need not be genetically related in the sense that they should be regarded as going back to a single reconstructable proto-form. The fact that we find in Greek a stem κακκα- and in Irish a stem *cacca-* therefore does not say anything about whether PIE had a corresponding word. And even if it had, the fact that in Greek and Irish geminates are found does not say anything about whether the corresponding PIE word would have contained a geminate. The same goes for the other words reconstructed with a geminate by Byrd (cf. the occurrence in Turkish of *ata* 'father' and *ana* 'mother' as well). I therefore do not regard these words relevant for the hypothesis presented here.

Indo-European branches at that point in time still formed a single language community that underwent some common innovations that Anatolian did not share, resulting in a language stage that in this paper has been called "classic Proto-Indo-European". On the basis of this paper, one of the innovations of classic PIE vis-à-vis PIH can be assumed to have been a remodeling of the original stop system in the following way (including the development of the form for 'you are'):[76]
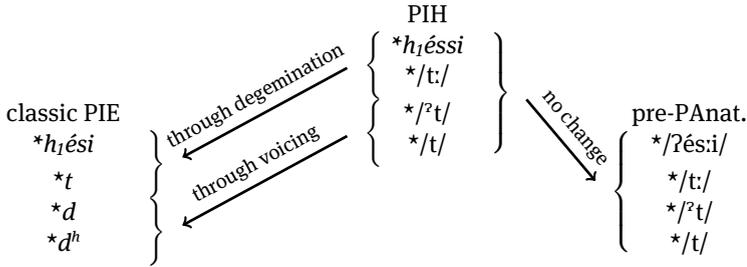
13 Excursus: the assibilation rule of *-*TT*-

In all IE languages traces can be found that indicate that already in the mother language a cluster of two dental stops received an epenthetic sibilant, yielding a sequence *-*TsT*-. This sequence was retained as such in Anatolian, but was simplified to *-tt-* in Sanskrit,[77] to *-st-* in Iranian, Greek, and Balto-Slavic, and to *-ss-* in Italo-Celtic and Germanic. Examples include: PIE *$*h_1d$-té+* > Hitt. *azzašteni* /ətst:éni/ 'you (pl.) eat'; PIE **uóid-th₂e* > Gr. οἶσθα, Skt. *véttha* 'you know'; and PIE **uid-to-* > Skt. *vittá-*, Av. *vista-* 'found', Goth. [*un*]*wiss* '[un]certain', OIr. *fess* 'known'; etc. Since this assibilation is also found in Anatolian, it should not only be reconstructed for the classic Proto-Indo-European stage, but also for Proto-Indo-Hittite.

As was argued above, the Proto-Indo-Hittite stop system contains a series of long/geminate stops, one of which is dental, */t:/. The question now arises how

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76 Note that the PIH stop system */t:, ²t, t/ also explains the corresponding Tocharian system, /t, tˢ, t/, more easily than the classic PIE one, */t, ²d, d/ (or, if one adheres to the traditional model, */t, d, ḍ/). This could be an indication that Tocharian had also split off from PIH before the latter underwent the phonological innovation that made it into classic PIE. But to what extent this can be supported by other evidence falls outside the scope of the present paper.

77 Note that in Sanskrit a real **s* was also lost when standing between two stops, cf. e. g. the 3sg.med. form of the *s*-aorist of *mad-* 'to rejoice', which is *amatta* < **h₁e-med-s-to* (vs. its corresponding 3pl. form *amatsata* < **h₁e-med-s-ṇto*).

this relates to the assibilation rule *-*TT*- > *-*TsT*- as formulated for PIE and that must have been valid for Proto-Indo-Hittite as well. Why did the PIH long/geminate */tː/ not participate in this rule (note that long/geminate [tː] is sometimes noted down as [tt] as well)? The answer to this question can be found in the way the assibilation rule functions in Hittite.

In Hittite, the assibilation of clusters of dental stops is a rule that still operates on the synchronic level. Take, for instance, the 2sg.pres. form of the verb *et-ᶻⁱ/at-* 'to eat'. In the New Hittite text KUB 36.13, this form is spelled *e-ez-za-a*[*t-ti*] (i 3), which can be phonologically analyzed as /ʔétstːi/. This form reflects a (transposed) preform *$h_1$éd-th$_2$ei* in which an epenthetic *s* has developed between the *d* of the verbal root and the *t* of the ending. Yet this form is not old: it has replaced an original form /ʔétsːi/ < *$h_1$éd-si* (which is still attested as such in the Old Hittite text KBo 22.1 obv. 28, where it is spelled *e-ez-ši*), by replacement of the original *mi*-conjugation 2sg. ending -*šši*[78] with the corresponding *ḫi*-conjugation ending -*tti*.[79] In other words, the form *ezzatti* /ʔétstːi/ is an inner-Hittite creation, which proves that the assibilation of such clusters was still a synchronic rule in Hittite.

It is therefore interesting in this light to see that Hittite does not show assibilation of its fortis dental stops: a form like *dātten* 'you must take' has a geminate -*tt*- but is not subject to assibilation. One could perhaps argue that this means that assibilation only occurs at the syllable boundary (/ʔét + tːi/ > /ʔétstːi/) and not if the geminate was tautosyllabic. But this would imply that *dātten* should be syllabified as /tːʔáːten/, which contradicts the fact, as discussed above, that the -*tt*- in *dātten* counts as a closing factor of the first syllable, since this is the only way to explain why the OH long /ā/ of the first syllable was shortened to NH /a/: OH *dātten* /tːʔáːten/ > NH *datten* /tːʔáten/.

The only way to account for these facts is to assume that the long dental stop, /tː/, was phonemically and phonetically distinct from a combination of two lenis dental stops, /t/ + /t/.[80] Although /t/ + /t/ undergoes assibilation, /tː/ does not, which indicates that the latter was a monophonemic entity.[81]

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78 In postconsonantal position the 2sg.pres. ending is -*šši*, with a long /sː/, as can be seen by spellings like *e-ku-uš-ši* 'you drink' (KUB 1.16 iii 29).

79 Which is a development that is visible throughout the Hittite verbal system in the post-OH period, cf. Kloekhorst 2008a: 751. Note that the /s/ in NH /ʔétstːi/ is not taken over from the OH ending /-sːi/, since in e. g. OH /ʔépsːi/ » NH /ʔéptːi/ 'you seize' the /sː/ of the ending /-sːi/ has not been taken over in the renewed form either.

80 Although in Hittite itself I have found no examples where two lenis dental stops form a cluster that undergoes assibilation, such clusters are known from the other IE languages, e. g. Gr. ἐπείσθην (aor.pass. of πείθω 'to persuade') < *h_1e-b^{h}eid^h-d^{h}eh$_1$-m*.

81 This distinction between, on the one hand, monophonemic long stops and, on the other, geminates that form a biphonemic cluster, is comparable to the situation in e. g. Avar, where

Since this system is synchronically functioning as such in Hittite, I do not see any problem assuming that it was also present in Proto-Anatolian and in Proto-Indo-Hittite. I therefore conclude that the Indo-European/Proto-Indo-Hittite rule of assibilation of clusters of dental stops does not contradict the reconstruction of the Proto-Indo-Hittite stop system as having a series of long stops, one of which was dental, namely */t:/.

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"apart from the opposition tense ∼ lax /sː ∼ s/, one also finds for the same type of phonemes the opposition geminate single /sːs: s:/, compare *xásel* 'winter' vs. *t'á-s:a* 'from above, off' vs. *xás:s:-a-b* 'special'" (Ebeling 1966: 63).

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