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Productivity and Transparency in Instrument Nouns
Formation in Palestinian Arabic

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1. Introduction

This proposed study examines the formation of instrument nouns (INs) in Palestinian Arabic (PA). It will examine the semantic and morpho-phonological factors that are responsible for the productivity of different morphological patterns. Focus is on doublet formation, where the same IN is formed in two (or more) different patterns with no change of meaning. Such variation is demonstrated in two online examples in (1).

(1) a. bi-ssiki:n willa bi-l-**miqfare**?

‘with a knife or a **peeler**?’ (<https://www.paldf.net/forum/showthread.php?t=83694&page=8&styleid=15>)

b. bidu:n **qaffa:ret** il-bat^ʕa:t^ʕa bilzamni 2 ki:lo

‘without a potato **peeler** I would need 2 kilos’ (<https://www.paldf.net/forum/showthread.php?t=83694&page=8&styleid=15>)

The IN 'peeler' surfaces as two forms which are phonologically related. Both INs share the consonantal root *q-f-r*, and are formed in two patterns, *miCCaCe* (*miqfare*) (1a) and *CaCCa:Ce* (*qaffa:re*) (1b). As shown, both doublets share the same meaning and can occur in similar contexts. More examples of such doublets are presented in (2).

(2) Morphological variation of INs in PA¹

dabba:se	madbase/midbase	'stapler'
xaffa:qa	mixfaqa	'hand-mixer'
midfa'a/midfaye	daffa:ye	'heater'
maffa:t ^ʕ a	mu ^ʕ ut ^ʕ /mi ^ʕ it ^ʕ	'comb'

Why does such variation exist? The proposed study will address the factors that are responsible for such variation and well as to the formation of INs in PA in general. The selection of one pattern and not another will be examined with respect to the relation between INs and verbs that are related to them. For example, the INs *miqfare* and *qaffa:re* in (1) are both related to the verb *qaffar* 'peeled' with respect to both form and meaning. INs formation will be examined according to three criteria: (i) structural transparency between INs and verbal counterparts (if any); (ii) semantic transparency between INs and verbal counterparts; and (iii) grammatical gender of INs.

¹ PA, as well as other Arabic dialects, demonstrate variation with respect to the final vowel of bother patterns (*e/a*) as well as the first vowel of the *miCCaCa/maCCaCe* pattern. These differences are irrelevant to this proposal.

2. Theoretical Background

2.1. Linguistic variation and doublet formation

Variation is inherent in human languages and is crucial to the study of the language faculty. Different speakers can express the same meaning using different forms, but also the same speaker can use different forms for the same meaning. Morphological variation is also known as “overabundance” or “polymorphy”, where a cell within a paradigm can be filled by more than one form (Anttila 2007). The forms that fill the same cell are labeled “doublets” (see Aronoff 1976, Kroch 1989, Corbett 2010, Mörth & Dressler 2014) or “cell-mates” (Thornton 2012). The two (or more) forms are in competition, as they can in principle be used in the same syntactic and semantic contexts. Competing forms within a single morphological slot deviate from canonicity, as defined in Corbett (2010), and pose a challenge for models that aim to explain why and how speakers select one form and not another. Linguistic variation often results from a change that languages undergo at some point and whose result becomes established in the grammar. The issue of linguistic variation and change has been addressed by linguists since the 19th century, following Neogrammarian accounts of sound change (Bloomfield 1933, Hinskens et al. 1997). Various studies have associated variation and change with the speaker’s competence and considered variation an inherent part of natural language. The study of linguistic change and competition from a synchronic point of view can contribute to linguistic theory by providing a unique perspective on the properties involved in a particular grammatical phenomenon and of the interrelations between them (Macken 1992).

Variation is also associated with competition for grammaticality and use under certain approaches. On these views, the grammar generates numerous structures or words that express the same meaning and includes a mechanism for selecting one winner, marking the rest as ungrammatical (Embick 2008). This means that if one variant is employed, another is not (see also Plag 2003, Bauer 2006). Nevertheless, in some cases more than one competitor is selected as grammatical, with these variants in competition for surface use. Thornton's (2012) case studies of cell-mates refers to cases of competing inflectional forms that demonstrate complete synonymy. This is typical mainly for inflection, as inflectional categories are determined by the morpho-syntax (Stump & Finkel 2013, Aronoff, 2017) and rival inflectional patterns are unable to differentiate themselves in their denotation. The picture is different with respect to competition between derivational processes and patterns. Aronoff (2017) shows that competing derivational affixes are less likely to be in real competition. Since there are no necessary paradigm cells to fill in derivation, in contrast to inflection, it is impossible to count how many inputs or outputs there are for a given morphological process. Furthermore, semantic and

pragmatic factors allow competing derivational patterns to differentiate themselves in many ways, where each pattern can have its own niche. Aronoff shows that a great deal of similarity exists between competing derivational affixes and ecological niche differentiation, in which natural selection drives competing species into different distribution patterns of resource use. Most studies of doublets formation have focused mostly on languages like English, French, Italian and others, while fewer studies have examined it in Semitic languages (see Bolozky 1999, 2003, Ravid 1999, Meir 2008, Laks 2013, 2015, Gonen & Reshef, to appear). Specifically studies on doublet formation in Arabic, and especially Palestinian Arabic are rather rare (see Blanc 1960, Bloch 1971, Holes 2004, Dallaji & Gabsi 2016, Laks & Yousef 2020). The proposed research is one step on this direction, and it aims at revealing factors that trigger doublets formation of INs as well as the factors that block it.

2.2. Instrument nouns formation

Instrument nouns are classified into primary/basic nouns, such as *pen* and *knife*, and derived nouns (Ono 1992, Luján 2010, Luschützky & Rainer 2013). Derived INs are predominantly deverbal. For example, the IN *printer* is derived from the verb *print* by suffixation of *-er*. Denominal INs such as Spanish *paellera* ‘paella pan’ (from *paella* ‘paella’) are relatively rare. Deverbal INs in general denote artifacts that have been created for performing the action expressed by the base verb, as in Latin *aratrum* ‘plough’ (from *arare* ‘to plough’) (Luschützky & Rainer 2013). Different languages use different strategies for deriving INs. For example, in French, the suffix *-eur* is used to produce INs, such as *broyeur* grinde (cf. *broyer* ‘grind’) or *lanceur* ‘launcher’ (from *lancer* ‘launch’), the Latin suffix *-torium* is used in INs like *patorium* ‘drinking cup’ (cf. *potore* ‘drink’), and in Russian the suffix *-ščik* is found in some INs, e.g. *pikirobščik* ‘dive-bomber’.

INs are usually associated with specific word formation processes and are therefore recognized as distinct semantic categories (Haspelmath, 2003). In some languages, INs and location nouns are formed by the same processes. For example, the Albanian suffix *-esë* is found, for example, in the IN *kullesë* ‘strainer’ (from *kulloj* ‘I strain’) and in the location noun *kthesë* ‘turn, curve’ (from *kthej* ‘I turn’) (Newman, Hubbard & Prifti 1982).

2.3. Word formation in Semitic languages

2.3.1. Root and pattern morphology

Semitic word formation relies highly on non-concatenative morphology, also known as root and pattern morphology. Verbs are formed only via non-concatenative morphology. The verbal systems consists of patterns, which indicate the prosodic structure of verbs, their vocalic patterns and their affixes (if any), for example the PA verbs *katab* (*CaCaC*) ‘wrote’) and *inkatab*

(*inCaCaC*) 'was written'. Every new verb that enters the language must conform to one of the existing patterns. Various studies have examined the relation between verbal pattern in Arabic (Younes 2000, Benmamoun 2003, Henkin 2010, Glanville 2011, Shawarbah 2012, Ouhalla 2014, among others), but fewer studies have examined the nominal patterns. Noun formation in is in general more varied in its formation strategies. Nouns can be formed in patterns but are also formed by affixation and other word formation strategies, as well as by borrowing from other languages (see Hammond 1988, Amairah, 2001, Darwish, 2002, Watson 2002, Yasin et al., Ibrahim 2010, 2016 and references therein). Arabic has several patterns that are used for INs formation, where some are more common than others. Some patterns are demonstrated for PA in (3).

(3) PA instrument noun patterns

Pattern	Example	
CaCCa:Ce	ħas ^s a:de	'harvester/mowing machine'
maCCaCe	madbase	'stapler'
CaCCa:C	barra:d	'refrigerator'
miCCaC/maCCaC/ muCCaC	mufta:ħ	'key'
CaCu:Ce	t ^ʿ aħu:ne	'grinder'
Ca:Cu:C	ħa:su:b	'computer'
Participle Pattern - Ca:CeC	ha:tef	'telephone'
Participle Pattern - maCCu:C	majru:d	'dustpan'
Participle Pattern - muCaCCiC	mukabbir	'enlarger'

The proposed study examines the productivity of the different IN patterns, with focus on cases where the same IN is formed in two patterns. I first describe the results of a study in INs in Hebrew in the next sub-section.

2.3.2. Doublet formation in Hebrew instrument nouns

Laks (2015, 2017) examined doublet formation within Hebrew INs and agent nouns. Various studies examined the formation of derived nominals in Hebrew (Berman 1978, 1999, Berman et al.1982, Ravid & Avidor 1998, Bolozky 1999, Ravid 1999, Reshef 2012, Borer 2013), while only a few studies have examined them in Arabic (Rosenhouse 2008, Islam et al. 2010, Armon-Lotem et al. 2020). INs tend to receive an additional form as shown in (4), similarly to the PA examples in (2).

- (4) a. *maghec* *megahec* 'iron'
 b. **masxeta(t)-micim** **soxet-micim** 'juicer'

Both INs in each pair (4) share the same root consonants and are formed in different patterns. *maghec* and *megahec* (4a) are formed in *maCCeC* and *meCaCeC* respectively. Following Bolozky (1999, 2003), Laks argues that INs tend to change into patterns that are identical to the participle form of the corresponding verb. While both *maghec* and *megahec* share the nominal meaning, only *megahec* is a participle form ('irons') of the verb *gihec* 'ironed'. Participle patterns have a special status with regard to the lexical categories they host (Berman 1978, 2017, Ravid 1990, Owens & Yavrumyan, Bat-El 2008, Doron 2013, among others). Participle patterns demonstrate polycategoriality, defined as a case of lexical items that share the same surface form, but function as different lexical -grammatical categories (Berman 2017). They can also denote INs, e.g. *sorek* 'a scanner/scans', and also adjectives, e.g. *meratek* 'fascinating/fascinates'. The study reveals that the change is always from the non-participle patterns into participle patterns and never the other way around. Nonetheless, not all INs change their pattern, e.g. *mašʔef* - **šoʔef* (N) 'inhaler', *masxeta* - **soxet* (N) 'juicer', where participles function only as verbs. Laks (2015) argues that the formation of such doublets results from the interaction of morpho-phonological and semantic criteria. Specifically, the formation in participle patterns targets morphological and semantic transparency between the IN and the related verb. INs that are not related to verbs do not have doublets (*mazleg* 'fork'). That is, candidates for doublet formation must be part of derivational paradigms (*sinen* 'filtered'- *masnen/mesanen* 'a filter'). From the morpho-phonological aspect, the formation in participle patterns results in morphological transparency. The transition from verbal forms to participles does not change the syllabic structure of the stem, as the only changes are the addition/change of a prefix and in some cases a change of vowel(s). In contrast, the transition to non-participle patterns also requires modification of the syllabic structure. The morphological mechanism thus targets derivational paradigms with minimal alternations. On the semantic dimension, the relations between INs and their verbal counterparts also have to be transparent for a morphological change to take place. Derived nominals correspond to the argument structure of related verbs and their thematic roles (Grimshaw 1990, Rappaport-Hovav & Levin 1992, Alexiadou & Schafer 2010, among others). Specifically, INs, have to be agentive in the sense that they can perform the action that verbs denote, making the relations between them thematically transparent. Examine *gihec* 'ironed' -*maghec* 'an iron' (4a). The relation is transparent as an iron can perform the action of ironing (*ha-maghec gihec* 'the iron ironed'). Indeed, the IN has a

participle doublet (*megahec*). In contrast, examine the pair *šaʔaf* 'inhaled' - *mašʔef* 'inhaler'. There is a semantic relation between them, but it is less transparent, because the IN does not perform the action (**ha-mašʔef šaʔaf** 'the inhaler inhaled'), but only facilitates performing it. Consequently, such INs do not have doublets (the participle *šoʔef* is only verbal). This distinction with regard to the semantic transparency between verbs and INs is based on a more general distinction between intermediary and facilitating/enabling INs, based on their semantics and the syntactic positions in which they can appear (Rappaport-Hovav & Levin 1992, and references therein). Moreover, many INs have doublets when they are heads of compounds. Examine the pair *saxat* 'squeezed' - *masxeta* 'juicer', where the IN is formed in a non-participle pattern (*maCCeCa*), denoting only a noun. This IN does not have a doublet, and the participle *soxet* only denotes a verb 'squeezes'. However, when the same IN is the head of the compound *masxetat-micim* ('juicer' lit. juicer-juices), it does have a doublet *soxet-micim* (4b). The presence of both the instrument itself and the patient in the same noun phrase makes the IN semantically more transparent in the sense that it corresponds to the thematic roles that the verb assigns. Many studies have pointed out the thematic relations between the elements on deverbal compounds, i.e. whose head is verb-derived (e.g. *pain killer*). Theta-role relations inside such compounds are shown to be related to the properties of the argument structure of the verb (Di Sciullo & Ralli 1999, Leiber & Scalise 2006, among others). The more transparent the thematic relation between verbs and their derived INs, the greater the likelihood for morphological change. These studies highlight the importance of semantic transparency, which in general has been shown to play an important role in morphology (see Aronoff 1976, 2017, Anderson 1992, Libben et al. 2003, Plag et al. 2008, Rainer 2011).

3. Research Plan

3.1. Hypotheses

Based on the studies discussed so far, the picture that emerges is that morphological change, which results in doublet formation, is motivated by the following criteria: (i) Morpho-phonological criteria: the morphological system aims at forms that demonstrate structural transparency; (ii) Semantic criteria: the change targets semantic transparency between words and their derived counterparts. The change is therefore towards patterns that are typical for specific semantic function. The more transparent the semantic relation between the verb the derived nominal, the greater the likelihood of morphological change. In addition, argument realization is expected to play a significant role in morphological change such that forms that derived nominals that take arguments are more subject to doublet formation. The main

hypothesis is that doublet formation in PA follows similar constraints as in Hebrew. It is therefore expected to find doublet formation that would target more regular form-meaning relations. Derivation is general is characterized by a greater extent of irregularities and gaps, in comparison to inflection. However, speakers seem to aspire to some degree of regularization of morphology of derivational relations, and they do so based on systematic guidelines. In contrast to Hebrew, PA seems to be less tolerant to polycategoriality and ambiguity. Participle patterns, which are by definition polycategorial, seem to avoid ambiguity in PA. While cases on the same participle form functioning as verbs and INs are highly common in Hebrew, such cases are rare in PA (see preliminary results). It is expected that the morphological mechanism would target non-participle patterns in the formation of INs. In addition, morphological change is expected mostly in derived forms, which are part of paradigms. INs that are not derived from verbs and that do not belong to a derivational paradigm are less expected to have doublets.

3.2. Research design and work stages

The goal of the proposed study is two-folded: (i) Identifying the degree of morphological variation and its limits in PA INs; (ii) Accounting for the factors that trigger and block morphological variation, based on previous studies on Hebrew. To this end, I will create a database on PA INs, their doublets (if any) and the verbs that are related to them (if any). Data collection will be based on four sources.

3.2.1. Dictionaries

Two dictionaries of colloquial PA, Elihay (2005) and Lubani (2006), as well as books and papers on PA (e.g. Levine 1995, Jastrow 2004) will be used. At first stage, I will go over the two dictionaries and books and build a database of INs and verbal counterparts. Items will be classified according to their root and pattern, as well as semantic features. Verbs will be classified according to patterns. This will be an initial division according to types that exist in the literature, but a more delicate classification will be conducted throughout the process. INs will be classified according to their derivational relations within verbs. Cases of morphological doublets will be marked separately so they can be monitored and counted.

3.2.2. Google-based word searches

I will examine the degree to which doublets of INs are indeed used and differences in their usage. It is important to mention the pitfalls of using online web-searches. It is not always possible to know whether the online examples were produced by PA native speakers. This is even more crucial in Arabic in light of the issue of diglossia and the various dialects (see Saiegh-Haddad 2012 and references therein). It is not always possible to know whether the examples were produced by PA speakers or were written in Modern Standard Arabic. In light of these

methodological issues, searches will be based only on websites like blogs, chats, Facebook and twitter, where speakers tend to write in colloquial Arabic and not Modern Standard Arabic (Warschauer et al. 2002, Palfreyman & Al-Khalil 2007, Abu Elhija 2012). In addition, searches will be conducted on websites that are typically used by PA speakers.

3.2.3. Spoken corpus of PA

I will conduct interviews with 20 PA speakers with different professions, as an additional source of information. These texts will be interactive, where I will interview participants and ask them about their profession and the instruments, tools and machines that they use. This will increase the chances of participants using INs when describing their work.

3.2.4. Experimental data

I plan to design an experiment in which participants will be shown picture of INs and will have to name them. This provide additional evidence for the patterns that are preferred.

4. Preliminary Results

Preliminary results are based on the examination of the distribution of 94 INs in the Olive Tree dictionary of Palestinian Arabic (Elihay 2005) as well as web searches. The results show noticeable gaps in the productivity of the INs patterns. As shown in the appendix, *CaCCa:Ce* is the most productive pattern, followed by *maCCaC* and *maCCaCe*. This echoes with the results of a recent study by Armon-Lotem et al. (2020), which examined the acquisition of nominal patterns in PA. 29% (27/94) of the INs are formed exclusively *CaCCa:Ce*, while 15% (14/94) and 14% (13/94) of the INs are formed exclusively in *maCCaCe* and *maCCaC* respectively. INs that are formed exclusively in other patterns are relatively rare. INs of the participle pattern *Ca:CeC* make only 6% (6/94), while other pattern like *CaCu:Ce* are extremely rare, making between 1%-3% of all INs. This does not include INs that are formed in more than one pattern. A web search reveals that 25% of the INs have doublets. As shown in the appendix, most doublets are cases where one doublet is formed in *CaCCa:Ce*. 12% of such cases were INs in *CaCCa:Ce* and *maCCaCe*, 7% in *CaCCa:Ce* and another pattern, and 5% in *maCCaCe* and another pattern which is not *maCCa:Ce*. Some of the *CaCCa:Ce* INs are not documented in dictionaries (e.g. *ħarra:θe* and *miħra:θ* ‘plow’), but they can be found in actual use. The picture that emerges is that some INs tend to take an additional form in *CaCCa:Ce* with no change of meaning. Similarly to the example of *miqfa:re* and *qaffa:re* ‘peeler’ in (1), *daffa:ye* (5a) and *midfaye* (5b) share the same stem consonants *d-f-y*, are formed in *CaCCa:Ce* and *maCCaCe* respectively. Both denote ‘heater’ and are used in similar contexts.

(5) a. *yayyir il-midfaye* kuliyan wu-xudha ila msalliħ il-midfaaya:t

‘Change the **heater** completely and take it for the person who fixes heaters’

<https://www.djelfa.info/vb/showthread.php?t=2167949>

b. biddak **daffa:ye** ? yalla tʃala ʃala pafu:t zol.

‘Do you need a **heater**? Come on to Pafut Zol’ <http://bladna.co.il/?mod=articles&ID=9451>

Why is *CaCCa:Ce* the most productive pattern? In order to account for the selection of INs patterns, I examined the relation between the INs and the verbs to which they are semantically related. 63% (17/27) of the INs that are formed by *CaCCa:Ce* are related to both verbal patterns *CaCaC* and *CaCCaC*, while 11% (3/27) are related only to *CaCCaC* and 26% (7/27) are related only to *CaCaC*. Other verbal patterns are extremely rare. The preference to *CaCCa:Ce* over other patterns, and specifically *maCCaCe* and *maCCaC* can be explained by structural transparency between the IN and the related verb. Verbs in of *CaCaC* and *CaCCaC* do not consist of a consonant cluster, similarly to INs in *CaCCa:Ce*. In contrast, *maCCaCe* and *maCCaC* consist of a consonant cluster. As a result, the transition from the verbal form to the IN form is morphologically more complex as it involves more changes in the syllabic structure of the verb. Examine for example, the INs *dabba:se* (*CaCCa:Ce*) and *midbase* (*miCCaCe*) 'stapler'. Both are related to the *CaCCaC* verb *dabbas* 'staple'. The formation of *dabba:se* (6a) involves lengthening of the second vowel and suffixation, while the formation of *midbase* (6b) involves prefixation, degemination, vowel deletion and affixation. It results in a consonant cluster that does not exist in the base form.

(6) a. *dabbas* → *dabba:se*

b. *dabbas* → *midbase*

The formation in *CaCCa:Ce* is therefore more faithful to the verb form and the relations between them are more transparent. As a result, there is greater tendency to form INs in *CaCCa:Ce* with respect to both the formation of new INs and the formation of doublets of existing forms. The proposed study will examine other types of relations between INs and verbal counterparts.

The results also show a strong tendency to form INs in patterns that are grammatically feminine as they end with *a/e*. 70% (66/94) of the INs are feminine, while 30% (28/94) are masculine. Why is it so? There seems to be no semantic reason this selection. We assume that feminine patterns, and specifically *CaCCa:Ce*, are selected in order to create a morphological distinction between INs and other types of nouns. For example, the *CaCCa:C* pattern, which is masculine, is used for the formation of agent nouns, e.g. *dahha:n* 'painter'. The morphological mechanism

avoids the formation of INs in *CaCCa:Ce* in order for every semantic category to have a different pattern. The feminine forms of *CaCCa:Ce* agent nouns are indeed *CaCCa:Ce*, which is identical to the IN pattern, e.g. *dahha:ne* 'painter (fem.)'. However, we assume that inflected forms are not stored in the lexicon but are derived in the syntax. Following Laks's (2017) analysis for Hebrew, we assume that the morphological distinction between semantic categories is only relevant to words that are stored in the lexicon.

5. Contribution of the study

The study will add to previous accounts of morphological changes that take place cross-linguistically in different domains, but have not received a great deal of attention in Arabic, and specifically in the Palestinian dialect. It will enable to shed more light on the motivation for doublet formation both from morphological and semantic perspectives, with special reference to the strong correlation between semantic properties, argument realization and morpho-phonological processes. More specifically, the study will allow a closer examination of PA derivational morphology and the relations between verbs and derived nominals with special reference to the root and pattern morphology and the status of the consonantal root. Many studies have examined derived nominals in Hebrew, highlighting the high degree of irregularity and variation, and what it tells us about the morphology-semantics interface, but only few studies have examined it in Arabic. The results of this study can set the stage for further studies of the formation of other derived nominals like agent nouns and location nouns, as well as for studies of other Arabic dialects.

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Appendix - Productivity of PA instrument noun patterns

Pattern	Number	Percentage
CaCCa:Ce only	27	29%
maCCaCe only	14	15%
CaCCa:C only	5	5%
miCCaC/maCCaC/ muCCaC only	13	14%
CaCCa:Ce and maCCaCe	7	7%
CaCCa:Ce and miCCaC/maCCaC/ muCCaC	6	6%
CaCCa:Ce and maCCaCe and CaCCa:C and miCCaC/maCCaC/ muCCaC	1	1%
maCCaCe and miCCaC/maCCaC/ muCCaC	2	2%
CaCCa:Ce and maCCaCe and participle pattern - Ca:CeC	2	2%
CaCCa:Ce and participle pattern - muCaCCiC	0	0%
maCCaCe and participle pattern - Ca:CeC	1	1%
maCCaCe and participle pattern - maCCu:C	2	2%
maCCaCe and CaCu:Ce and CaCu:C	1	1%
CaCu:Ce (no variation)	2	2%
Participle Pattern - Ca:CeC(no variation)	6	6%
CaCu:C (no variation)	3	3%
miCCaC/maCCaC/ muCCaC and participle pattern - maCCu:C	1	1%
CaCCa:Ce and maCCaCe and CaCCa:C and participle pattern - Ca:CeC (no variation)	1	1%
Total	94	100%