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FUNCTIONAL UNIT CLASSIFIERS IN (NON)-CLASSIFIER RUSSIAN[1]

ABSTRACT: It has often been argued that functional individuating classifiers and plural count nouns ought to be in complementary distribution (e.g. Borer 2005; Chierchia 2010). This apparently works neatly for Chinese and English. Russian, however, is an interesting case. On the one hand it has count nouns which can be directly modified by numerals. On the other hand it has three classifiers, *štuka* 'item', *čelovek* 'person' and *golova* 'head', which optionally occur in numeral constructions with plural nouns and look very much like functional individuating classifiers (cf. Sussex 1976; Yadroff 1999). I show that a closer look at the data reveals that apparently count constructions using these optional classifiers have properties of measure constructions such as *five liters of water*. Based on that I argue that these classifiers are not individuating classifiers but are measure words which measure mass denotations in terms of natural units in the sense of Krifka (1989, 1995).

1. INTRODUCTION

The literature on the semantics of counting and mass/count distinction commonly distinguishes between classifier and non-classifier languages. In classifier languages, for example Mandarin, all nouns, even those which refer to clearly distinguishable individuals, cannot be counted directly and require a classifier (1). Such classifiers are referred to as individual, sortal (Chao 1968; Lyons 1977; Cheng & Rint 1998), natural unit or object unit classifiers (Krifka 1989, 1995).

(1)   a.   wu *(ge) jidan
              five CL   egg
              'five eggs'
        b.   wu *(wei) gongren
              five CL   worker
              'five workers'
        c.   wu *(zhi) niu
              five CL   cow
              'five cows'

Classifier languages are contrasted with non-classifier languages such as English, which have count nouns that can be directly modified by numerals (2).

(2)   a.   five eggs
        b.   five workers
        c.   five cows

The proposed terminology is misleading. Non-classifier languages also use individuating classifiers to count (cf. Rothstein 2009, in press, this volume and Landman 2004, this volume). Some illustrative examples of counting constructions with classifiers are shown in (3). In (3a) individual pieces of furniture are counted, in (3b) individuals bottles filled with cognac are counted and (3c) refers to individual chocolate bars.

(3)   a.   We bought five amazing pieces/items of furniture.
        b.   To our utmost surprise we found five bottles of cognac of different sizes in our mini-bar.
        c.   The shopkeeper put five bars of fine Belgium chocolate with different flavorings in front of me.

However, English individuating classifiers in (3) and Mandarin classifiers in (1) are very different. Tang (1990); Cheng & Sybesma (1999) and Li (2013) have shown that individual classifiers in Mandarin form a

separate grammatical category. These are functional expressions at type $<k, <e,t>>$ which denote functions from kinds to sets of instantiations of the kind (Krifka 1995; Chierchia 1998; Li 2013). Sortal classifiers do not contribute any novel truth-conditional content to sentences in which they occur (although they presuppose that the individuals they pick out have certain properties), and perform a purely grammatical function of mapping a mass noun onto a count predicate (Li 2013). In contrast, Rothstein (2009; in press) has shown that English count classifiers are a lexical category. They are count relational nouns at type $<<e,t>,<e,t>>$ which take mass or plural count predicates as arguments and map them onto count plural predicates with a different lexical meaning.

Some theories of the mass/count distinction suggest that count nouns and sortal classifiers ought to be in complementary distribution (e.g. Borer 2005; Chierchia 2010). If a language has a category of count nouns it will not need a separate functional category of individuating items and, conversely, a language which has only mass nouns will require a separate syntactic category of individuators. This apparently works neatly for English and Mandarin.[2] Recent studies, however, reveal that some languages do not fit the proposed dichotomy. Hungarian, for example, has both count nouns and sortal classifiers (Schvarcz 2014, in press; Schvarcz & Rothstein in press).

Against this background, Russian is an interesting case. On the one hand it has count nouns (4) which can be counted directly and used as individuating classifiers (5).

(4)   a.   pjat' predmetov kotorye dolžny byt' v dome u každogo
              five object$^{GEN\ PL}$ which must be in house at every
              'Five things that everyone must have in his house.'

        b.   pjat' pustyx butylok s šumom skatilis' na pol
              five empty bottle$^{GEN\ PL}$ with noise rolled down on floor
              'Five empty bottles rolled down on the floor making much noise'

(5)   a.   pjat' neobyčnyx predmetov mebeli
              five unusual object$^{GEN\ PL}$ furniture$^{GEN\ SG}$
              'five unusual items of furniture'

        b.   pjat' butylok vina razbilis' vdrebezgi
              five bottle$^{GEN\ PL}$ wine$^{GEN\ SG}$ crush to pieces
              '(The) five bottle of wine crushed to pieces.'

On the other hand it has a small class of classifiers which optionally occur in counting constructions. This class includes three items: *štuka*, *čelovek* and *golova* (6) (Sussex 1976). These classifiers apparently designate countable units (Ožegov & Švedova 2008) and do not add lexical content to the expressions in which they appear and, therefore, look very much like sortal classifiers.

(6)   a.   pjat' (štuk) jaic
              five item$^{PL\ GEN}$ egg$^{PL\ GEN}$
              'five eggs'

        b.   pjat' (čelovek) stroitelej
               five person$^{PL\ GEN}$ builders$^{PL\ GEN}$
              'five builders'

        c.   pjat' (golov) korov
              five head$^{PL\ GEN}$ cow$^{PL\ GEN}$
              'five cows'

Given the assumption that the only function of sortal classifiers is to map non-count denotations onto count, why would they occur with plural nouns as in (6) which are count in the first place? More specifically there are at least three questions to be asked: (i) Are these classifiers nominal or functional? (ii) What kind of complements do they take? (iii) What is their semantic function?

In this paper I address these questions in turn and claim that: (i) While *predmet* and *butylka* in (5) are lexical nouns, *štuka*, *čelovek* and *golova* in (6) are, as observed in Sussex (1976) and Yadroff (1999), functional expressions, like sortal classifiers in Mandarin; (ii) However, *štuka*, *čelovek* and *golova*, unlike sortal classifiers in Mandarin and like nominal classifiers in English, take predicates and not kind-denoting terms as their complements; (iii) Apparently count expressions with *štuka*, *čelovek* and *golova* have properties of measuring expressions. Based on that I propose that these classifiers are not individuating expressions but are a closed set of functional measure expressions at type $<n,<e,t>>$ analogous to *liter*, which measure quantities of entities in

terms of natural/object units in the sense of Krifka (1995, 1989).

The paper is structured as follows. In the following section we briefly discuss the semantics of counting constructions in Mandarin and English, focusing on the differences between functional and nominal classifiers. In section 3 I show, following Yadroff (1999) that *štuka*, *čelovek* and *golova* are not lexical nouns. In section 4 I bring evidence that these classifiers do not operate on kinds but take predicates as their complements. In section 5 we discuss the differences between counting and measuring expressions and I will show that *štuka*, *čelovek* and *golova* are best analyzed as measure words referring to natural units. Section 6 presents the central conclusions.

2. BACKGROUND

2.1. Counting Classifiers in Classifier Languages (Mandarin) are Functional Expressions at type <k,<e,t>

Linguists agree that Mandarin classifiers such as in (1) have properties of functional heads rather than of nominal (lexical) expressions (Tang 1990; Cheng & Sybesma 1999; Li 2013). Firstly, as seen in (1) individual classifiers, unlike lexical expressions, do not add any "descriptive content" (Li 2013). They presuppose certain properties of nouns which they select (e.g. *ge* is a general classifier, *ke* is a classifier for plants, *zhi* is used with nouns denoting animals). Secondly, many classifiers cannot be used as nouns (Li 2013). For example, a classifier *zhi* cannot be used to make reference to an animal, even if preceded by another sortal classifier (7).

(7) a. yi zhi dou
         one Cl dog
         'a dog'
     b. * yi ge zhi
         one Cl Cl
         Intended: 'an animal'

[Li 2013:28]

Li (2013) points out that some classifiers (especially container classifiers) may have a nominal use. But then they behave differently when used as classifiers and as nouns. For example, when *xiang* 'box' is used

as a classifier, it is directly preceded by *one* (8a), whereas as a noun it requires a sortal classifier to be counted (8b).

(8) a. yi **xiang** pingguo
         one Cl_box apple
         'a box of apples'
     b. yi *(ge) **xiang**
         one Cl_general box
         'one box'

[Li 2013:25]

Thirdly, Mandarin classifiers form a closed class. "Each subtype of classifier has stable and conventionalized members" [Li 2013:23]. This is a characteristic of functional expressions (cf. Abney 1987).

It has been argued extensively that all nouns in Mandarin are non-countable mass expressions which denote kinds (Krifka 1995; Chierchia 1998; Yang 2001; Li 2011, 2013). Individuating classifiers then serve to derive countable predicates from these non-countable kind-denoting terms. Formal compositional analyses of Mandarin classifiers as operators on kinds are found in Krifka (1995); Chierchia (1998); Li (2011, 2013); Li & Rothstein (2012); Rothstein (in press). The interpretation in (9) is a simplified version of the analysis proposed in Li & Rothstein (2012) and Rothstein (in press). Classifiers are operators at type $<k, <e,t>>$ applying to a kind denoting mass noun at type k and producing a predicate which denotes the set of individual (atomic) instantiations of that kind which can be counted (9). The proposed interpretation reflects the fact that the classifier presupposes that nouns with which it can combine have certain properties. For example, *zhi* is a classifier for animals (e.g. *yi zhi mao* 'one Cl cat') and *tiao* is a classifier for long-shaped entities (e.g. *yi tiao he* 'one Cl river'). If a classifier is used in such a way that the presupposition is not satisfied the whole expression will be infelicitous (# *yi tiao mao*).

(9) The interpretation of count classifiers in Mandarin:
     $\|Cl\|_{<k, <e,t>>} = \lambda k \lambda x.\ x \in \cup k$
     Presupposition: $\cup k \subseteq \{x: x \in P\}$
     Cl applies to a kind denoting term and generates the set of individual atomic instantiations of k. It is presupposed that every individual in this set has a property P

The proposed interpretation is developed on the basis of the following assumptions about the semantics of counting expressions: (i) Counting is a cardinal operation on atoms. For a plural individual, x, $|x| = |\{y: y \sqsubseteq x \land y \in \text{ATOM}\}|$ and, therefore, countable predicates ought to have clearly specified atoms in their denotation (cf. Link 1983, 1984; Landman 1991; Chierchia 1998, 2010; Rothstein 2010 among others); (ii) Singular count predicates denote sets of atoms $\|\text{cow}\| = \{a,b,c\}$. Plural predicates denote sets of sums of atoms derived via applying the operation of closure under sum to sets of atoms, $\|\text{cows}\| = \{a,b,c, a\sqcup b, a\sqcup c, b\sqcup c, a\sqcup b\sqcup c\}$ (Link 1983)[3]; (iii) Numerals are intersective predicate modifiers which denote sets of sums of atoms (pluralities) with n number of atomic parts, $\lambda x.\ |x| = n$ (Landman 2003, 2004).

Wu zhi niu in (1) is then interpreted as follows in (10). *Zhi* combines with the mass *niu* denoting the COW kind and produces a count predicate denoting the set of atomic individual instantiations of this kind (10a,b). The presupposition of *zhi*, that the units denoted by *zhi N* are units of animals, is satisfied. This count predicate is then pluralized (10c) (notice that in Mandarin the pluralization is not expressed morphologically) and modified intersectively by a numeral *wu* denoting the set of all pluralities (sums of atoms) with 5 atomic parts (10d). The derived expression is a plural predicate denoting the set of pluralities of individuals instantiating the COW kind where each plurality contains five atomic parts (10e).

(10)   *wu zhi niu* 'five Cl cow'

     a. $\|\text{zhi}\|_{<\boldsymbol{k},\ <e,t>>} = \lambda \boldsymbol{k}\lambda x.\ x \in {}^{\cup}\boldsymbol{k}$
               Presupposition: ${}^{\cup}\boldsymbol{k} \subseteq \{x: x \in \text{ANIMAL}\}$
     b. $\|\text{zhi niu}\|_{<e,t>} = \lambda x.\ x \in {}^{\cup}\text{COW}_{\text{kind}}$
         The set of atomic individuals instantiating the COW kind
     c. $\|\text{zhi niu}\|_{<e,t>} = \lambda x.\ \text{PL}(x \in {}^{\cup}\text{COW}_{\text{kind}})$
         The set of sums of atomic instantiations the COW kind
     d. $\|\text{wu}\|_{<e,t>} = \lambda x.\ |x| = 5$
         The set of sums of atomic individuals s.t. each sum has 5 atomic parts
     e. $\|\text{wu zhi niu}\|_{<e,t>} = \lambda x.\ \text{PL}(x \in {}^{\cup}\text{COW}_{\text{kind}}) \land |x| = 5$
         The set of sums (pluralities) of atomic instantiations of the COW kind s.t. each sum consists of 5 atomic parts.

To sum up, counting classifiers in Mandarin are functional operators at type $<\boldsymbol{k},<e,t>>$ which apply to non-countable kind-denoting nouns and generate grammatically countable predicates.

2.2. Counting Classifiers in Non-Classifier Languages (English) are Count Relational Nouns at type $<<e,t>,<e,t>>$

Rothstein (in press) shows that English counting classifiers, such as in (3), are different from Mandarin classifiers in two major respects. One is that counting classifiers in English are lexical nouns and not functional expressions. As shown in (11) counting classifiers have nominal intransitive uses.

(11)   a.   The company has found a hole in its accounts relating to the way it has accounted for certain revenue **items**.
               [http://www.oxforddictionaries.com/definition/english/item]
     b.   The vase broke to **pieces**.
     c.   There were **bottles** on the table.
     d.   **bars** on the window

Furthermore, counting classifiers in English are an open class. As illustrated in (12) sortal, non-relational nouns which are normally not used as classifiers, may shift to such a use in certain contexts. This further supports that English classifiers are a lexical category.

(12)   Two classrooms of pupils were evacuated.

Another difference between counting classifiers in the two languages is that English counting classifiers take predicates and not kind denoting terms as their complements. This is witnessed by the data in (13) showing that complements of count classifiers can have stage-level and temporal modifiers (Rothstein in press).

(13)   a.   six slices of yesterday's bread
     b.   three spoons of lightly-beaten eggs

                                       [Rothstein in press]

Rothstein thus proposes that English count classifiers are nominal expressions which start off as sortal count nouns denoting sets of atomic individuals (14a). As classifiers they shift to a relational use in (14b)

on which they apply to mass or plural count predicates and produce a count predicate.[4]

(14) a. $\|N\|_{<e,t>} = \lambda x.\ N(x)$
      b. $\|N_{Cl}\|_{<<e,t>,<e,t>>} = \lambda P\lambda x.\ N(x) \wedge \exists y\ [P(y) \wedge RELATION\ (x,y)]$

Five glasses of milk, for example, is compositionally interpreted as shown in (15). A classifier *glass* applies to a mass predicate *milk* and generates a count predicate denoting the set of individual glasses containing milk (15a). This predicate is pluralized[5] and modified by a numeral *five* (15b) resulting in a plural count predicate denoting the set of pluralities of individual glasses with milk, each of which consists of five atomic parts (15c).

Expressions with plural count complements such as *five glasses of berries* are interpreted analogously (16).

(15) *five glasses of milk*
      a. $\|glass\ of\ milk\ \|_{<e,\ t>} = \lambda x.\ GLASS(x) \wedge \exists y\ [MILK(y) \wedge CONTAIN(x,y)]$
      b. $\|five\|_{<e,t>} = \lambda x.\ |\ x\ | = 5$
      c. $\|five\ glasses\ of\ milk\ \|_{<e,t>} = \lambda x.\ PL(GLASS)(x) \wedge \exists y\ [MILK(y) \wedge CONTAIN(x,y) \wedge |\ x\ | = 5]$

(16) *five glasses of berries*
      a. $\|glass\ of\ berries\ \|_{<e,\ t>} = \lambda x.\ GLASS(x) \wedge \exists y\ [PL(BERRY)(y) \wedge CONTAIN(x,y)]$
      b. $\|five\|_{<e,t>} = \lambda x.\ |\ x\ | = 5$
      c. $\|five\ glasses\ of\ berries\ \|_{<e,t>} = \lambda x.\ PL(GLASS)(x) \wedge \exists y\ [PL(BERRY)(y) \wedge CONTAIN(x,y) \wedge |\ x\ | = 5]$

Thus count classifiers in English are relational nouns at type <<e,t>,<e,t>> which map mass or plural count predicates onto count plural predicates. In the proposed framework counting classifiers in English are not individuating operators per se like they are in Mandarin. Counting classifier constructions are count because classifiers which head them are themselves count nouns.

2.3. *An Attempt for a Unified Analysis of Counting Classifier Expressions in English and Chinese*

In the previous two sections we saw that counting numeral classifier constructions in English and Mandarin are plural count predicates. However, the internal semantic structures of such expressions are different in the two languages. Krifka (1989, 1995) pursues a different idea, arguing that numeral constructions in English and Chinese are interpreted via the same mechanisms and that the difference between the two languages is only in the morphosyntax. The two papers are not identical. Here I first focus on the 1995 version.

Krifka (1995) argues that nouns in both types of languages are born as <u>mass, kind-denoting terms</u> and require classifiers in order to combine with numerals. In Chinese classifiers are always syntactically overt, as in (17), whereas in English they are overt in some cases, as in (18a,b), and lexically concealed in other cases, as in (18c).

(17) a. wu *(zhi) niu
          five Cl_{animal} cow
          'five cows'
      b. wu *(sheng) shui
          five Cl_{liter} water
          'five liters of water'

(18) a. five *(liters) of water
      b. five *(head) of cattle
      c. five cows

In particular Krifka proposes that *wu zhi niu* in Mandarin and *five cows* in English are semantically equivalent to *five object units of cow ^{MASS}*. The OBJECT UNIT is a classifier ('natural unit' NU in the 1989 version). It is overt in Mandarin (*zhi*) but lexically concealed in English. This classifier is a measure expression analogous to *liter*. It combines with a numeral and a kind-denoting term and produces a measure predicate denoting the set of quantities of instantiations of the kind which measure n number of object units (19).[6]

(19) a. $\|zhi\| = \lambda n\lambda k\lambda x.\ x \in {}^{\cup}k \wedge OU_k(x) = n$
      b. $\|wu\ zhi\| = \lambda k\lambda x.\ x \in {}^{\cup}k \wedge OU_k(x) = 5$
      c. $\|wu\ zhi\ niu\| = \lambda x.\ x \in {}^{\cup}COW_k \wedge OU_{cow\ kind}\ (x) = 5$

The set of quantities of instantiations of the cow kind which measure 5 object units.

For *five cows* in English, Krifka (1995) proposes two possibilities for a compositional interpretation. One option is that OU classifier is built into the structure of count nouns. Krifka assumes that all count nouns are derived from root nouns which have a mass denotation and that mass nouns in English, like all nouns in Mandarin, are kind denoting terms. The OU operator applies to a kind term to give a count noun at type $\langle n, \langle e, t \rangle \rangle$ (20).

(20)   [five [Cl cow]]

      a. $\|OU\| = \lambda \boldsymbol{k} \lambda n \lambda x.\ x \in {}^{\cup}\boldsymbol{k} \wedge OU_k(x) = n$

      b. $\|cow\| = OU(COW_{kind}) = \lambda n \lambda x.\ x \in {}^{\cup}COW_k \wedge$
         $OU_{cow\ kind}(x) = n$

      c. $\|five\ cows\| = \lambda x.\ x \in {}^{\cup}COW_k \wedge OU_{cow\ kind}(x) = 5$
         The set of quantities of instantiations of the cow kind which measure 5 object units

Another possibility is that the OU classifier is built into the structure of a numeral (21). Then numerals are interpreted at type $\langle \boldsymbol{k}, \langle e, t \rangle \rangle$ and denote relations from kinds to sets of quantities of individual instantiations of the kind.

(21)   [[five Cl] cow]

      a. $\|OU\| = \lambda n \lambda \boldsymbol{k} \lambda x.\ x \in {}^{\cup}\boldsymbol{k} \wedge OU_k(x) = n$

      b. $\|five\| = OU(5) = \lambda \boldsymbol{k} \lambda x.\ x \in {}^{\cup}\boldsymbol{k} \wedge OU_k(x) = 5$

      c. $\|five\ cows\| = \lambda x.\ x \in {}^{\cup}COW_k \wedge OU_{cow\ kind}(x) = 5$
         The set of quantities of instantiations of the cow kind which measure 5 object units

In either case, *five cows* is a measure predicate which denotes the set of quantities of instantiations of the cow kind to the amount of 5 object units.

In the proposed framework nouns in the two types of languages are mass expressions denoting kinds, and counting involves measuring quantities of instantiations of a kind. The shift from a kind to instantiations of the kind occurs by means of the object unit operator. In Chinese the OU operator is expressed by a lexical item, the classifiers. In English,

the OU operator is built into another lexical item, either a numeral or a count noun. In the earlier version of the analysis from 1989, Krifka suggests that the individuating operator, which he then calls 'natural unit' operator, is incorporated in the structure of count nouns in English. In that version he treats mass denotations in languages of both types as predicates and not as kinds. Thus natural unit classifiers take predicates and not kind denoting terms as arguments.

Both versions of Krifka's analysis face problems. One problem is that it treats counting as a form of measuring, implying that counting constructions such as *five cows*/*five items of furniture* and measuring expressions such as *five liters of water* have the same semantics. Recent studies, however, have shown that measuring and counting expressions in English, and many other languages including Chinese, have different denotations and, therefore, counting and measuring ought to be different operations (Landman 2004, this volume; Rothstein 2009, 2011, in press, Khrizman et al. 2015–for English; Li 2011, 2013–for Chinese). The details will follow in section 5 where I will also show that the semantic contrast between counting and measuring is attested in Russian.

The second problem concerns specifically the proposal in (21). If numerals in non-classifier languages involved a concealed unit classifier in their structure they would be expected to combine felicitously with mass nouns denoting entities which naturally come in clearly distinguishable units ('naturally atomic' mass nouns (cf. Rothstein 2010), for example *furniture*. As shown in (22) this holds neither for English nor for Russian.

(22)   a.   #five furniture(s)

      b.   #five footwear(s)

      c.   #pjat' mebeli/   mebelej
         five   furniture[SG] / furniture[PL]

      d.   #pjat' obuvi/   obuvej
         five   footwear[SG] / footwear[PL]

The conclusion is then that counting constructions such as *five cows* in English or *pjat' korov* in Russian cannot be analyzed as involving measuring in natural units. But, Russian, unlike English, has the option of using classifiers *štuka, čelovek* and *golova* in its counting expressions. In this paper I will argue that constructions using these classi-

fiers are indeed best analyzed as instantiating such an operation. More specifically, I shall claim that these classifiers are neither count relational nouns, as *piece/glass* in English are (see sec. 2.1), nor functional operators from kinds to sets of atomic individuals, as Mandarin classifiers are (see sec.2.2). Instead, they are measure operators measuring mass predicates in natural units.

3. *ŠTUKA, ČELOVEK* AND *GOLOVA* ARE NOT LEXICAL NOUNS

We will now see that, as observed in Sussex (1976) and Yadroff (1999), the classifiers *štuka, čelovek* and *golova* behave as functional expressions rather than as nouns. I will show that they contrast with counting classifiers such as *predmet/kusok* 'item/piece' or *butylka* 'bottle' which are indeed nominal.

i. Descriptive content

Štuka, čelovek and *golova* do not contribute any novel lexical content to expressions in which they appear. This is seen in the data in (23) showing that sentences with and without a classifier do not create a contrast in meaning.[7]

(23)   a.   ja prosila pjat' jaic   #a on kupil   pjat' štuk   jaic
                I asked five egg^{PL} but he bought five item^{PL} egg^{PL}
                'I asked for five eggs, but he bought five items of eggs.'

        b.   my prosily nanjat' pjat' stroitelej, #a oni   nanjali pjat'
                we asked hire   five builder^{PL} but they hired   five
                čelovek   stroitelej
                person^{PL} builder^{PL}
                'We asked to hire five builders, but they hired five persons of builders.'

        c.   fermer dolžen byl zakupit' pjat' korov, #a zakupil pjat'
                farmer must   was buy   five cow^{PL}, but bought five
                golov korov
                head^{PL} cow^{PL}
                'The farmer was supposed to buy five cows, but he bought five head of cows.'

ii. Presuppositional vs. truth-conditional

Similarly to sortal classifiers in Mandarin, *štuka, čelovek* and *golova* are restricted to certain types of nouns. *Štuka* picks out inanimate nouns, *čelovek* occurs with nouns denoting humans and *golova* takes nouns denoting farm animals (Sussex 1976).[8] Crucially, if these restrictions are not satisfied the resulting constructions are infelicitous and not false (24), which shows that the restrictions are presuppositional and not truth-conditional.

(24)   a.   #pjat' štuk   korov/   stroitelej
                five   item$^{GEN\ PL}$ cow$^{GEN\ PL}$/ builder$^{GEN\ PL}$

        b.   #pjat' čelovek   korov/   jaic
                five   person$^{GEN\ PL}$ cow$^{GEN\ PL}$/ egg$^{GEN\ PL}$

        c.   #pjat' golov   stroitelej/   jaic
                five   head$^{GEN\ PL}$ builder$^{GEN\ PL}$/ egg$^{GEN\ PL}$

iii. Nominal use

These classifiers have intransitive nominal uses. However, they have different meaning and/or different grammatical properties as nouns and as classifiers.

    For example, as mentioned in the beginning of this section, while *golova* as a noun refers to a body part (25), as a classifier it makes reference to a unit of livestock (26).

(25)   pastux   pogladil korovu po golove
        shepherd patted cow   on head
        'The shepherd patted the cow on its head.'

(26)   a.   odin pastux   možet pasti do 20 golov   korov
                one shepherd can   graze to 20 head$^{GEN\ PL}$ cow$^{GEN\ PL}$
                'One shepherd can graze up to 20 cows.'

        b.   #pastux   paset golovy
                shepherd graze head$^{ACC\ PL}$
                Intended: 'The shepherd is grazing cattle.'

Yadroff (1999) points out that *štuka* classifier does not have any ""encyclopaedic" meaning" [Yadroff 1999:151] but is used to refer to inanimate units. We observe that *štuka* can be used as a content item. How-

ever, as such it has a very narrow, restricted meaning. In particular it may be used to refer to an unusual or interesting object or a pattern of behavior (27).

(27)   a.   kakaja interesnaja štuka
            what interesting item^{SG}
            'What an interesting item/thing.'
     b.   ty éti svoi štučki bros'!
            you these your thing^{PL} drop
            'Stop with your tricks!'
     c.   #na stole ležali štuki
            on table lay item^{PL}
            Intended: 'There were some objects on the table.'

As a classifier *štuka* is not restricted in the same way and, as mentioned, can be used to talk about any inanimate object.

Čelovek also shows differences between the classifier and nominal uses. In particular, Yadroff (1999) shows that *čelovek* as a noun and as a classifier have different paradigms in morphological case (28)-(29).[9]

(28)   čelovek$^{NOM\ SG}$ - ljudi$^{NOM\ PL}$/*čeloveki$^{NOM\ PL}$ - ljudej$^{GEN\ PL}$/čelovek$^{GEN\ PL}$

(29)   a.   pjat' čelovek stroitellej/ *ljudej
            five person$^{GEN\ PL}$ builder$^{GEN\ PL}$/people$^{GEN\ PL}$
            stroitelej
            builder$^{GEN\ PL}$
            'five builders'
     b.   v komnate ne bylo ljudej/ *čelovek
            in room not were people$^{GEN\ PL}$/ person$^{GEN\ PL}$
            'There were no people in the room.'

iv. Adjectival modification

Another argument showing that štuka, čelovek and golova are not full lexical nouns is the observation that they cannot be modified by adjectives. Yadroff (1999) shows this for *štuka* and *čelovek* (30). We observe the same with *golova* (31).

(30)   a.   *pjat' bol'six/isporčennyx štuk jaic
            five big/rotten item$^{GEN\ PL}$ egg$^{GEN\ PL}$

            Intended: 'five rotten eggs'
     b.   *pjat' sil'nyx čelovek rabočix
            five strong person$^{GEN\ PL}$ workers$^{GEN\ PL}$
            Intended: 'five strong builders'

(31)   *pjat' krupnyx golov furažnyx korov
       five big head$^{GEN\ PL}$ forage cow$^{GEN\ PL}$
       Intended: 'five big forage cows'

v. Syntactic dependency

Functional heads have been shown to require complements (Abney 1987). Yadroff shows that *štuka* and *čelovek* cannot appear without a numeral (32a, b). We show the same for golova classifier (32c). Assuming that numerals are selected by these classifiers, the latter observation is another argument for treating these items as functional heads.

(32)   a.   *on kupil štuk/i jaic
            he bought item$^{GEN\ PL/ACC\ PL}$ egg$^{GEN\ PL}$
            Intended: 'He bought some eggs.'
     b.   *ja vstretila čelovek stroitelej
            I met person$^{GEN\ PL}$ builder$^{GEN\ PL}$
            Intended: 'I met a few builders.'
     c.   *na pole paslis' golovy ovec
            on field grazed head$^{NOM\ PL}$ sheep$^{GEN\ PL}$
            Intended: 'Sheep grazed in the field.'

vi. Closed set

Finally, these classifiers, just like sortal classifiers in Mandarin, are a closed class. Sussex (1976) observes that they cannot be replaced by nouns with a similar meaning (33).

(33)   a.   *pjat' veščej karandašej
            five thing$^{GEN\ PL}$ pencil$^{GEN\ PL}$
     b.   *pjat' mužčin stroitelej
            five man$^{GEN\ PL}$ builder$^{GEN\ PL}$

Crucially, constructions with *štuka, čelovek* and *golova* contrast with classifier constructions with *predmet/kusok* and *butylka*. The latter have

a nominal use and express the same meaning when used as nouns and as classifiers (34). Furthermore, they have the same morphosyntactic properties as classifiers and as nouns. In particular, (35) shows that they can be modified by adjectives[10] and (36) shows that these classifiers can be used without numerals.[11]

(34) a. na stole stojali butylki/   ležali različnye predmety
          on table stood bottle[NOM PL]/ lay   different object[NOM PL]
          'There were bottles/different objects on the table.'

      b. ne xvataj kuski   sjad' normal'no poeš
          not grasp piece[ACC PL] sit   normally eat
          'Don't take pieces here and there. Sit down and have a
          proper meal.'

                                    [http://jekkyv.ru/text_kuski.php]

(35) a. pjat' bol'šix   butylok vody
          five big[GEN PL] bottle water[GEN SG]
          'five big bottles of water'

      b. pjat' samyx   staryx   butylok   vina   v mire
          five most[GEN PL] old[GEN PL] bottle[GEN PL] wine[GEN SG] in world
          'the five world's oldest bottles of wine'

      c. pjat' ogromnyx kuskov   mjasa
          five huge[GEN PL] piece[GEN PL] meat[GEN]
          'five huge pieces of meat'

(36) a. na polkax ležali butylki   vina
          on shelves lay   bottle[ACC PL] wine[GEN SG]
          'There were some bottles of wine on the shelves.'

      b. mama predložila kotu kusoček   mjasa   no on
          mother offered cat piece[ACC DIM SG] meat[GEN SG] but he
          otkazals'a ego est'
          refused   him to eat
          'My mother offered our cat a small piece of meat, but he
          refused to eat it.'

Further, counting classifiers are an open category. Sortal nouns which are usually not used as relational may shift to a classifier use (37).

(37) …k čemu snitsja   čemodan   deneg
       to what dream[REFL] case[NOM=ACC SG] money[GEN SG]

'…what it means if one dreams about a suitcase with money'
                    [http://enigma-project.ru/sonnik/chemodan]

Given all the above arguments we conclude that *štuka, čelovek* and *golova* are different from nominal counting classifiers such as *item, piece* and *bottle*. While the latter are nouns, the first have properties of functional expressions. Therefore we cannot analyze these classifiers as count relational nouns in the sense of Rothstein (2009, in press).

4. *ŠTUKA, ČELOVEK* AND *GOLOVA* ARE NOT OPERATORS ON KINDS

In the previous section we saw that *štuka, čelovek* and *golova* pattern with sortal classifiers in Mandarin in a variety of respects. However, unlike in Mandarin, in Russian these classifiers occur with plural count nouns. Given that Russian plural nouns can be interpreted as referring to kinds as well as predicates denoting sets of individuals (38) (cf. Dayal 2004) we could suggest that plural complements in constructions with *štuka, čelovek* and *golova* are also kind terms and the classifiers are functions from kinds to predicates just like sortal classifiers in Mandarin are.

(38) a. včera   v cirke, tigry napali   na dressirovščika
          yesterday in circus tiger[PL] attacked on trainer
          'Yesterday, tigers attacked the trainer in circus.'

      b. tigry- životnye svoenravnye/ naxodjatsja na grani
          tiger[PL] animals willful/   be   on edge
          isčeznovenija
          disappearance
          'Tigers are very willful animals/in danger of becoming extinct.'

In what follows I argue against this hypothesis with four arguments showing that the complements of *štuka, čelovek* and *golova* are plural predicates and not kind terms.
    Firstly, nominal complements in constructions with *štuka, čelovek* and *golova* can be modified by temporal and stage-level modifiers (39).

(39) a. pjat' štuk   včerašnix kotlet
          five item[GEN PL] yesterday meatballs[GEN PL]

‘five yesterday’s meatballs’

b. našla pjat’ štuk noven’kix monet
found five item^GEN PL new coin^GEN PL
‘I found five new coins.’

[http://felomena.com/sonnik/m/moneta/]

c. 30 štuk prosročennyx jaic
30 item^GEN PL expired egg^GEN PL
‘thirty expired eggs’

[https://regnum.ru/news/cultura/1498305.html]

d. 20 golov molodogo skota
20 head^GEN PL young livestock^GEN MASS
’20 head of young livestock’

Secondly, it seems that these classifiers can have DP complements such as superlative and possessive nominal constructions (40)-(41).

(40) “..šest’ štuk samyx žyrnyx karasej…”- prikazal
six item^GEN PL most fat crucian carp^GEN PL ordered
kot
cat
‘ “Give me six of the fattest crucian carps..”- ordered the cat.’

[From *The Adventures of Buratino* by A.Tolstoj]

(41) 10 čelovek našix oficerov
10 person^GEN PL our^GEN PL officer^GEN PL
‘10 persons of our officers’

[Yadroff 1999: 146]

Thirdly, bare singular nouns in Russian can have a kind interpretation, and classifiers which operate on kinds such as *podvid* ‘subtype’ can take singular count complements (42). *Štuka, čelovek* and *golova* do not occur with singular count nouns (43), but if they denote functions from kinds to instantiations of the kind, they should.

(42) a. vsego vydelenno 9 podvidov tigra
in all distinguished 9 subtype^GEN PL tiger^GEN SG
‘ In total 9 subtypes of tigers have been distinguished.’

[https://otvet.mail.ru/question/15492926]

b. do six por učenye vydeljali vosem’
till this time scientists distinguished eight
podvidov tigrov
subtype^GEN PL tiger^GEN PL
‘Till now scientists have been distinguishing 8 subtypes of tigers.’

[https://otvet.mail.ru/question/15492926]

(43) a. 5 štuk perepelinyx jaic/ *perepelinogo
5 item^GEN PL quail^GEN PL egg^GEN PL/ quail^GEN SG
jaica
egg^GEN SG
‘five quail eggs’

b. 20 golov furažnyx korov/ *furažnoj
20 head^GEN PL forage^GEN PL cow^GEN PL/ forage^GEN SG
korovy
cow^GEN SG
‘20 forage cows’

c. 5 čelovek stroitelej- kamenščikov/ *stroitelja-
5 person^PL builder^GEN PL brick layer^GEN PL/ builder^GEN SG
kamenščika
brick layer^SG
‘ five builders-brick layers’

The fourth argument comes from so called singulative nominals. These are nouns which are derived from mass nouns using suffixes –*inka/-ina* as in *ris* ‘rice’ and *risinka* ‘a grain of rice’ (see Isačenko 1960; Corbett 2000; Trugman 2013). The contrast in (44) and (45), shows that while *ris* can be interpreted either as a predicate or as a kind denoting term, its singulative counterpart *risinka/risinki* has only a set interpretation.

(44)   a.   ris   proizrastaet vo vlažnoj srede
       rice grows   in wet   environment
       'Rice grows in wet environments.'
       b.   na tarelke ležalo nemnogo risa
       on plate   lay   little   rice
       'There was a small amount of rice on the plate.'

(45)   a.   #risinki   proizrastajut vo vlažnoj srede
       rice-*inka*[PL] grow   in wet   environment
       Intended: 'Rice grows in wet environments.'
       b.   na tarelko ležalo neskol'ko ris-inok
       on plate   lay   several   rice-*inka*[PL]
       'There were a few grains of rice on the plate.'

Also, Trugman (2013) shows that postnominal adjectival modification, which triggers a kind interpretation, is not possible with '-*inka/-ina*' nouns (46), which further supports the claim that such nouns are predicates.

(46)   a.   kartofel' rozovyj
       potato   pink
       'the pink potato'
       b.   #kartofel-*ina* rozovaja
       potato-*ina*   pink

[Trugman 2013, ex. 6]

If *štuka, čelovek* and *golova* take kind denoting complements, they should be incompatible with nouns of this type, which apparently cannot denote kinds. This is not the case. Google search indeed encounters occurrences of *štuka* with such nouns (47).

(47)   a. 10^{63} štuk   pesč-**inok**
       10^{63} item[GEN PL] sand-***inka***[GEN PL]
       '10^{63} grains of sand'

[http://math4school.ru/googol_i_vselennaja.html]

       b.   v gorode v 1 sm^3 vozduxa soderžitsja okolo
       in city   in 1 cm^3 air   contain   around
       100 000   štuk pyl-**inok**
       100 000[GEN PL] item dust-***inka***[GEN PL]

'In the city one centimeter of air contains about 100 000 of dust grains.'

[https://pedsite.ru/publications/73/3708/download/]

       c.   vzjat' po neskol'ko štuk   kartofel-**in**
       to take DIS several   item[GEN PL] potato-***ina***[GEN PL]
       raznyx   sortov
       different sort
       'To take a few spuds of different sorts…'

[https://books.google.co.il/books?isbn=5457265420]

Given the arguments above, we must conclude that *štuka, čelovek* and *golova* take predicates and not kind-denoting terms and can therefore not be analyzed analogously to Mandarin classifiers as functions at type $<k, <e,t>>$.

5. *ŠTUKA, ČELOVEK* AND *GOLOVA* ARE MEASURE UNIT CLASSIFIERS

We have seen that *štuka, čelovek* and *golova* are neither relational nouns like counting classifiers such as *piece* or *bottle*, nor are they operators from kinds to countable predicates like Mandarin individual classifiers are. Now I will propose an alternative analysis. I will show that constructions with *štuka, čelovek* and *golova* have properties of measure predicates (e.g. *five liters of water*) and not of genuine count predicates (e.g. *five eggs*).[12] Based on this I will argue that *štuka, čelovek* and *golova* are best analyzed as a closed set of measure words analogous to *liter*, which measure sums of entities in terms of natural units. I shall start with a general background on the semantics of counting and measuring.

5.1. *The Semantics of Counting and Measuring*

Intuitively, numeral NPs divide into two subtypes. Expressions such as *five boys* or *five items of furniture* in which individual entities are counted and expressions like *five liters of milk* or *five meters of cloth* in which quantities are measured in certain units.

Linguists often assumed that counting and measuring linguistic expressions have the same grammar. Either measuring was treated as a

form of counting (e.g. Lyons 1977; Gil 2013) or, conversely, counting was viewed as a form of measuring (Krifka 1989, 1995). Recent studies have shown that such analyses are not adequate, because counting and measuring expressions have different denotations and, hence, ought to have a different semantics. Such an approach has been introduced and developed in Landman (2004, this volume) and Rothstein (2009; 2010; 2011; in press; this volume). Below we briefly summarize the central points.

    Measuring and counting expressions denote typally different predicates. Measuring NPs such as *five liters of milk/five kilos of potatoes* are mass predicates denoting sets of non-individuated quantities of entities/stuff whereas counting NPs, for example *five boys/five items of furniture* are plural count predicates denoting sets of sums of atomic entities (Landman 2004; this volume; Rothstein 2009; 2011; in press; this volume). This may be seen in the distribution of the two types of expressions with respect to operators that require individuated antecedents. As shown in (48) counting NPs can be antecedents of such operators whereas measuring NPs do not allow individuation (49) (Rothstein 2009, 2011, in press; Landman this volume).

(48)   a.   Five boys sat next to each other.
           b.   Five items of furniture were piled on top of each other.

(49)   a.   #The cook mixed five kilos of flour with each other in a big pot.
           b.   #Five kilos of potatoes were piled on top of each other.

The two types of predicates ought to be derived by different operations. In the Landman-Rothstein framework the two operations are distinguished as follows. Counting is a cardinal operation which applies intersectively to sets of atomic pluralities and specifies how many atomic parts each plurality has, $\lambda x.\ |x| = n$, (50)- (51) (Link 1983, 1984; Landman 1991, 2003, 2004).

(50)   *Five boys*
        $\|$five$\| = \lambda x.\ |x| = 5$
         The set of all pluralities (sums of atoms) with 5 atomic parts

        $\|$boys$\| = \lambda x.\ \text{PL(BOY)}(x)$

        The set of pluralities of boys

        $\|$five boys$\| = \lambda x.\ \text{PL(BOY)}(x) \wedge |x| = 5$
        The set of pluralities of boys such that each plurality has 5 atomic parts

(51) $\|$five items of furniture$\| = \lambda x.\ \text{PL(FURNITURE ITEM)}(x) \wedge |x| = 5$
        The set of pluralities of furniture items with 5 atomic parts

Measuring involves an intersective operation which applies to mass predicates denoting sets of non-atomic pluralities (quantities)[13] and assigns to them an overall value on a dimensional scale calibrated in certain units, $\lambda x.\ \text{MEAS}(x) = <n, \text{UNIT}>$. This operation is expressed by measure predicates such as *five liters* (52) (Rothstein 2009, in press).

(52)   *Five liters of milk*
        $\|$liter$\| = \lambda n \lambda x.\ \text{MEAS}^{\text{VOLUME}}(x) = <n, \text{LITER UNIT}>$

        $\|$five liters$\| = \lambda x.\ \text{MEAS}^{\text{VOLUME}}(x) = <5, \text{LITER UNIT}>$
        The set of quantities which measure five liters in volume

        $\|$milk$\| = \lambda x.\ \text{MILK}(x)$
        The set of quantities of milk.

        $\|$five liters of milk$\| = \lambda x.\ \text{MILK}(x) \wedge \text{MEAS}^{\text{VOLUME}}(x) = <5, \text{LITER UNIT}>$
        The set of quantities of milk which measure 5 liters in volume

Rothstein (2011) argues that morphologically count plural complements in measure expressions (e.g. *five kilos of books/potatoes*) shift to a mass interpretation. She supports the claim using partitive constructions such as in (53). As seen *five kilos of potatoes* require *much* and not *many* as a determiner which shows that the whole construction is mass and this is possible only if the complement modified by *five kilos* is mass.

(53)   Much/#many of the five kilos of potatoes remained unused.

The semantics for measuring proposed in (52), as desired, derives measuring and counting expressions as predicates of two different types. Count-

ing expressions denote sets of pluralities of atomic individuals, measuring expressions denote sets of pluralities in which atomic parts are not (fully) specified.

Crucially, the proposed grammatical contrast is attested in Russian. Counting and measuring expressions have different properties.

i. Agreement

In Russian, numeral subjects allow two patterns of agreement with verbs. Either plural or singular neuter is possible (54) (Franks 1995).

(54) desjat čelovek   byli   gospitalizirovany/ bylo
      ten   person^{GEN PL} were^{PL} hospitalized^{PL}/   was^{SG}
      gospitalizirovano
      hospitalized^{SG}
      'Ten people were hospitalized.'

Counting numeral classifier constructions also allow for either pattern (55).

(55) a. na tarelke ležali dva bol'šix   kuska
          on plate   lay^{PL} two big^{GEN PL} piece^{PAUC=GEN SG}
          mjasa
          meat^{GEN MASS}
          'Two big pieces of meat lay on the plate.'

                                          [https://goo.gl/vAGPxn]

      b. na bljude…ležalo dva   bol'šix   kuska
          on plate   lay^{SG}two big^{GEN PL} piece^{PAUC=GEN SG}
          mjasa
          meat^{GEN MASS}
          'Two big pieces of meat lay on the plate.'

                                          [https://goo.gl/OFEqW2]

Franks (1995) points out that plural agreement is associated with an individuated interpretation whereas singular agreement indicates a non-individuated or collective/group interpretation (see also Pereltsvaig 2006). Singular agreement is not possible in constructions modified by explicit distributive operators such as reciprocals (56) (cf. Franks 1995).

(56) pjat' stakanov stojali /#stojalo odin na drugom
      five glass^{GEN PL} stood^{PL} /stood^{SG} one on other
      'Five glasses stood on top of each other.'

Crucially, Khrizman & Rothstein (2015); Matushansky & Ruys (2015a,b) note that in measuring contexts singular agreement is preferred (57)-(58).

(57) na étot pirog ušlo/   #ušli   pjat' jaic
      on this cake went^{SG} /went^{PL} five eggs^{GEN PL}
      'Five eggs were used to make this cake.'

                                          [Khrizman & Rothstein 2015]

(58) a. pri   sžiganii organičeskogo veščestva
          while burning organic   material
          vydelilos'/??vydelilis' 22 gramma   vody
          isolate^{SG}/isolate^{PL}   22 gram^{PAUC=GEN SG} water^{GEN MASS}
          'As a result of burning organic material 22 grams of water was isolated.'
      b. v kastrjule ležalo/??ležali 250 gramm   mjasa
          in pot   lay^{SG}/lay^{PL}   250 gram^{GEN PL} meat^{GEN MASS}
          'There was 250 grams of meat in the pot.'

Thus speakers' preferences with respect to agreement patterns suggest that counting expressions have individuated (count) denotations whereas measuring NPs have non-individuated (mass) denotations.

ii. Modification by individuating operators

Furthermore, as predicted, counting constructions can be modified by individuating operators (e.g. reciprocals) (59), whereas measuring expressions cannot (60). The examples in (60) imply that *kilos* should be interpreted as denoting discrete units which stay in the reciprocal relation. Since such an interpretation is not available (e.g. *kilos* in (60c) cannot be interlaced), the examples are infelicitous.

(59) a. pjat' predmetov mebeli   byli   paspoloženy
          five object^{GEN PL} furniture^{GEN MASS} were^{PL} situated^{PL}
          v centre komnaty na ravnom drug ot   druga
          in center room   on equal   one   from other

rasstojanii
distance
'Five items of furniture were situated in the center of the room equally far from each other.

b. dve plitki   šokolada   prilipli odna k
    two bar$^{\text{PAUC=GEN SG}}$ chocolate$^{\text{GEN MASS}}$ stuck   one to
    drugoj
    other
    'Two bars of chocolate stuck one to the other.'

c. pjat' klubnej   kartofelja   ležali drug na druge
    five tuber$^{\text{GEN PL}}$ potato$^{\text{GEN MASS}}$ lay   one on other
    'Five potato tubers were piled on top of each other.'

d. pjat' nitej   serebra   pereplelis' drug s
    five thread$^{\text{GEN PL}}$ silver$^{\text{GEN MASS}}$ interlaced$^{\text{PL}}$ one with
    drugom
    other
    'Five silver threads interlaced one with the other.'

(60) a. #dva s   polovinoj kilogramma   šokoladnyx
          two with half   kilo$^{\text{PAUC=GEN SG}}$ chocolate
          konfet   prilipli odna k drugoj
          praline$^{\text{GEN PL}}$ stuck   one to other
          'Two and a half kilos of chocolate pralines stuck one to the other.'

      b. #pjat' kilogrammov kartofelja   ležali drug na druge
          five kilo$^{\text{GEN PL}}$ potato$^{\text{GEN MASS}}$ lay$^{\text{PL}}$ one   on other
          'Five kilos of potatoes were piled on top of the other.'

      c. #pjat' kilogrammov serebrjannyx nitej
          five kilo$^{\text{GEN PL}}$ silver$^{\text{GEN PL}}$ thread$^{\text{GEN PL}}$
          pereplelis' drug s   drugom
          interlaced$^{\text{PL}}$ one   with other
          'Five kilos of silver threads interlaced one with the other.'

The conclusion is that counting and measuring constructions have different properties and, therefore, a different semantics. In the following section I will show that apparently counting constructions with *štuka, čelovek* and *golova* have properties of measuring constructions.

5.2. *Construction with Štuka, Čelovek and Golova are Measure Predicates*

I propose that constructions with *štuka, čelovek* and *golova* are measure predicates with the classifier introducing the unit of measure in the sense of Krifka (1989, 1995). More specifically, these classifiers are measure operators analogous to explicit measure words such as *litr* 'liter'. While *litr* measures the pluralities in liter units (61), these classifiers measure pluralities in natural units (62).

(61) *pjat' litrov N*→ The set of pluralities of N which measure five liters

(62) *pjat' štuk/čelovek/golov N*→ The set of pluralities of N which measure five natural units

This analysis makes two predictions. One is that the classifiers will require predicates whose referents naturally come in distinguishable units. I.e. they should occur not only with plural count nouns but also with mass nouns denoting naturally atomic entities. Second is that constructions using these classifiers will have properties of measure predicates and not of count plural predicates. In the following two subsections we will see that both predications are borne out.

5.2.1. *Štuka, Čelovek* and *Golova* take mass nouns as complements

Contra Sussex (1976) who assumes that *štuka* and *čelovek* always take count complements I show that these classifiers do occur with mass nouns (63)-(65).

(63) 5-6 *(štuk)   kuragi
      5-6 item$^{\text{GEN PL}}$ dried apricot$^{\text{GEN SG MASS}}$
      '5-6 dried apricots'

(64)   a.   5-6 *(štuk) pečenja/kartofelja
            5-6 item   biscuit$^{GEN\ MASS}$/potato$^{GEN\ MASS}$
            '5-6 biscuits/ spuds'
     b.   za god v mire proizvoditsja okolo trex milliardov
            in year in world produced   about three billion
            štuk   pečen'ja   s   predskazanijami
            item$^{GEN\ PL}$ biscuit$^{GEN\ MASS\ SG}$ with predictions
            'About three billion fortune cookies are made every year.'
            [http://www.orientalica.com/kitayskoe-pechene-s-predskazan
            iyami-retseptyi-i-istoriya]

(65)   na pervyx dvux po 10 čelovek   narodu
       on first   two DIS 10 person$^{GEN\ PL}$ crowd/people$^{GEN\ SG\ MASS}$
       'on the first two (ships) there were ten people on each'

            ['Poezdki po Severu Rossii v 1885-1886 godax', Sluchevskij, K.,
            Google books]

Golova classifier is also used with mass nouns (66).

(66)   20 golov   krupnogo rogatogo skota
       20 head$^{GEN\ PL}$ big   horned livestock$^{GEN\ SG\ MASS}$
       'twenty head of cattle'

Crucially, as predicted *štuka* and *čelovek* occur only with naturally atomic mass nouns as in the above examples and they are not compatible with mass nouns denoting stuff such as *water*, see (67).

(67)   *pjat' štuk   vody
       five item$^{GEN\ PL}$ water$^{GEN\ SG\ MASS}$

The conclusion is then that *štuka, čelovek* and *golova* require complements which make reference to entities which are associated with clearly distinguishable objects/units. This is exactly what we would expect if *štuka, čelovek* and *golova* were referring to natural units of P.

5.2.2. Constructions with *Štuka, Čelovek* and *Golova* have Properties of Measure Expressions

Now I will show that the properties of constructions with štuka, čelovek and golova are characteristic of measuring expressions and not of count-

ing expressions.

i. Štuka, čelovek and golova are preferred in measure contexts and less natural in counting contexts

Numeral constructions with and without *štuka, čelovek* and *golova* cannot always be used interchangeably with each other. These classifiers occur naturally in measure contexts making reference to the quantity properties of a collection of individuals, but are often degraded in count contexts in which the identification or identity of the individual atomic parts of the group must be salient.

For example, two cows may be referred to either as *dve korovy* 'two cows' or as *dve golovy skota* 'two head of livestock'. *Dve korovy* is felicitous in both, a count context in (68a) where we refer to two individual cows lying by the river and a measure context in (68b) where we refer to an overall quantity of livestock owned by a household. *Dve golovy skota* on the other hand is felicitous only in the measure context (69).

(68)   a.   dve korovy   ležali na beregu reki
            two cow$^{PAUC=GEN\ SG}$ lay on bank river
            'Two cows lay on the bank river.'
     b.   na každyj dvor prixodilos' po dve korovy
            on each   yard come   DIS two cow$^{PAUC=GEN\ SG}$
            'Each household owned two cows.'

(69)   a.   na každyj dvor prixodilos' po dve golovy
            on each   yard come   DIS two head$^{PAUC=GEN\ SG}$
            skota
            livestock$^{GEN\ MASS}$
            'Each household owned two head of livestock.'
     b.   ???dve golovy   skota   ležali na
            two   head$^{PAUC=GEN\ SG}$ livestock$^{GEN\ MASS}$ lay   on
            beregu reki
            bank river

Conversely, *pjat' golov svinej* 'five head of pigs' is very natural when used to describe the capacity of the factory (70a) whereas the variant without a classifier is infelicitous in the same context (70b).

(70) a. uboj   i   pervičnaja obrabotka pjati golov
         slaughter and intitial   processing five head[GEN PL]
         svinej
         pig[GEN PL]
         'slaughtering and initial processing of 5 pigs'
      b. #uboj   i   pervičnaja obrabotka pjati svinej
         slaughter and intitial   processing five pig[GEN PL]
         'slaughtering and initial processing of 5 pigs'

ii. Approximative inversion constructions

It has been argued independently that some apparently count constructions on approximative interpretation involve measuring and not counting (e.g. Li & Rothstein 2012 for Mandarin). Khrizman & Rothstein (2015) have shown that Russian inverted constructions with an approximative interpretation as in (71), including those which look like genuine count expressions (71b), denote measure predicates.

(71) a. litrov   pjat' moloka
         liter[GEN PL] five milk[GEN SG]
         'about five liters of milk'
      b. knig   pjat'
         book[PL GEN] five
         'about five books'

Thus following Khrizman & Rothstein (2015), while *pjat' knig* is a genuine count expression, its inverted variant *knig pjat'* involves measuring and not counting. Crucially, while *štuka, čelovek* and *golova* are acceptable but often sound redundant in non-inverted numeral constructions, they are very natural and clearly not redundant in inverted constructions (cf. Sussex 1976; Khrizman & Rothstein 2015; Matushansky 2015). In particular, many speakers think that, out of context, constructions such as in (72) are unnatural. The inverted variants in (73), however, are perfectly fine.

(72) a. pjat' štuk   jablok
         five item[GEN PL] egg[GEN PL]
         'five eggs'

      b. pjat' čelovek   stroitelej
         five person[GEN PL] builders[GEN PL]
         'five builders'
      c. pjat' golov   korov
         five head[GEN PL] cow[GEN PL]
         'five cows'

(73) a. štuk   pjat jaic
         item[GEN PL] five egg[GEN PL]
         'about five eggs'
      b. celovek   pjat' stroitelej
         person[GEN PL] five builders[GEN PL]
         'about five builders'
      c. golov   pjat' korov
         head[GEN PL] five cow[GEN PL]
         'about five cows'

Furthermore, Matushansky (2015) observes that inverted constructions are in fact more natural with classifiers than without them (74).

(74) [When the kidnapper rushed into the study, to his utter surprise he discovered that...]
      a. bankira okružalo   pjat' oxrannikov
         banker surrounded five bodyguard[GEN PL]
         'The banker was surrounded by five bodyguards.'
      b. #bankira okružalo   oxrannikov   pjat'
         banker surrounded bodyguard[GEN PL] five
         'The banker was surrounded by approximately five bodyguards.'
      c. bankira okružalo   čelovek pjat' oxrannikov
         banker surrounded people five bodyguard[GEN PL]
         'The banker was surrounded by approximately five bodyguards.'

                                          [Matushansky 2015:310]

Some additional examples with *štuka* and *golova* are in (75)-(76).

(75) a. ja kupila pjat' jaic   i   desjat' jablok
         I   bought five egg[GEN PL] and ten   apple[GEN PL]

'I bought five eggs and ten eggs.'

b. #ja kupila jaic pjat' i jablok desjat'
I bought egg^GEN PL five and apple^GEN PL ten
'I bought about five eggs and about ten eggs.'

c. ja kupila štuk pjat' jaic i štuk desjat'
I bought item^GEN PL five egg^GEN PL and item^GEN PL ten
jablok
apple^GEN PL
'I bought about five eggs and about ten eggs.'

(76) a. fermer priobrel pjat' korov i desjat' ovec
farmer purchased five cow^GEN PL and ten sheep^GEN PL
'A/The farmer purchased five cows and ten sheep.'

b. ??fermer priobrel korov pjat' i ovec desjat'
farmer purchased cow^GEN PL five and sheep^GEN PL ten
'A/The farmer purchased about five cows and about ten
sheep.'

c. fermer priobrel golov pjat' korov i
farmer purchased head^GEN PL five cow^GEN PL and
golov desjat' ovec
head^GEN PL ten sheep^GEN PL
'A/The farmer purchased about five cows and about ten
sheep.'

So, *štuka, čelovek* and *golova* are natural and even obligatory in approximative inversion constructions. Given the independently made claim that all inverted expressions are measure predicates, this distributional pattern is further evidence that *štuka, čelovek* and *golova* are used as units of measure.

iii. Decrease in animacy

Russian distinguishes between inanimate and inanimate forms of paucal numerals in accusative NPs (77) (cf. Vinogradov 1960).

(77) a. ja vižu **tri** stola
I see three^ACC INANIM table^PAUC
'I see three tables.'

b. ja vižu **trex** mal'čikov
I see three^ACC ANIM boy^GEN PL
'I see three boys.'

Measure contexts have been noticed to trigger decrease in animacy. This is witnessed by the observation that in measuring expressions numerals decline as inanimate even if used with animate nouns (78) (Mel'čuk 1980; Matushansky & Ruys 2015a,b).

(78) siloj rovno v **tri** medvedja
strength exactly in three^NOM =ACC INANIM bear^PAUC
'as strong as exactly three bears'

[Matushansky & Ruys 2015a,b following Mel'čuk 1980]

Matushansky & Ruys (2015a) show that when *čelovek* is used as a classifier it behaves as a measure expression, i.e. shows lack of animacy (79).

(79) nanjali **četyre** čeloveka/ *četyrex
hired four^NOM=ACC INANIM person^PAUC / four^GEN=ACC ANIM
čelovek učenyx
person^PL scientist^PL
'[They] hired four scientists.'

[Matushansky & Ruys 2015a]

iv. Numerals cannot be Dropped

In section 3 we saw that in construction with *štuka, čelovek* and *golova* numerals cannot be dropped (80), as opposed to count classifier constructions with nominal classifiers such as *butylka* 'bottle' or *kusok* 'piece' (81).

(80) a. *on kupil štuk/i jaic
he bought item^GEN PL/ACC PL egg^GEN PL
'He bought some eggs.'

b. *ja vstretila čelovek stroitelej
I met person^GEN PL builder^GEN PL
'I met a few builders.'

    c. *na pole paslis' golovy   ovec
         on field grazed head[NOM PL] sheep[GEN PL]
         'Sheep grazed in the field.'

(81) a. na polkax ležali butylki   vina
         on shelves lay   bottle[NOM PL] wine[GEN SG]
         'There were some bottles of wine on the shelves.'

    b. mama predložila kotu kusoček   mjasa   no on
         mother offered   cat   piece[ACC SG] meat[GEN SG] but he
         otkazals'a ego est'
         refused   him to eat
         'My mother offered our cat a piece of meat, but he refused
         to eat it.'

If constructions with optional classifiers are measure expressions, this is not surprising because in numeral NPs with explicit measure words such as *meter*, it is also very difficult to drop a numeral (82) (Mel'čuk 1985).[14]

(82) ??on kupil metry   sitca
         he bought meter[GEN PL] calico[GEN MASS]
         Intended: 'He bought a few meters of calico.'

Furthermore, the syntactic dependency on numerals has been shown to characterize measuring expressions in other languages as well. For example, Zhang (2011); Li & Rothstein (2012) show that in Chinese a numeral can be omitted on the individuating interpretation and cannot on the measure reading (83).

(83) a. wo mai le (yi) ben   shu   (individuating use)
         I   buy PRF one Cl$_{volume}$ book
         'I bought a book.'

    b. wo mai le   *(yi) gongjin pingguo (measure use)
         I   buy PRF one Cl$_{kilo}$ apple
         'I bought a kilo of apples.'

Thus the syntactic dependency on a numeral observed in constructions with optional classifiers also suggests that the latter are measure constructions.

v. Reduced individuation

Finally, constructions with *štuka, čelovek* and *golova* show decrease in individuation as compared to genuine count constructions. Firstly, singular agreement is often preferred in such constructions (84)- (85).

(84) a. v étom godu bylo   proizvedeno/byli prozvedeny
         in this   year was[SG] produced/were[PL] produced
         pjat'   graždanskyx samoletov
         five[GEN PL] civil   plane[GEN PL]
         'Five civil planes have been produced this year.'

    b. v étom godu bylo   proizvedeno/#byli prozvedeny
         in this   year was[SG] produced/were[PL]   produced
         pjat'**štuk** graždanskyx samoletov
         five   item[GEN PL] civil   plane[GEN PL]
         'Five civil planes have been produced this year.'

(85) a. v ofise rabotali/rabotalo   cetyre sekretarja
         in office worked[PL]/worked[SG] four   secretary[PAUC=GEN SG]
         'Four secretaries worked in the office.'

    b. v ofise rabotalo/??rabotali četyre **čeloveka**
         in office worked[SG]/worked[PL] four   person[PAUC=GEN SG]
         sekretarej
         secretary[GEN PL]
         'Four secretaries worked in the office.'

    c. v časti služilo/   služili   20 čelovek
         in part served[SG]/ served[PL] 20 person[GEN PL]
         '20 people served in the military department'

    d. v časti služilo/??služili   20 čelovek
         in part served[SG]/served[PL] 20 person[GEN PL]
         narodu
         people[GEN MASS]
         '20 people served in the military department'

With *golova* the contrast is less salient. Nonetheless, some speakers tend to prefer singular agreement (86).

(86) a. pogiblo/? pogibli 20 golov   skota
         died[SG]/   died[PL] 20 head[GEN PL] livestock[GEN MASS]

'Four head of livestock died.'

b. na zavode bylo/ ??byli pererabotany 200 golov
   on factory was/ were processed   200 head^GEN PL
   skota/   korov
   livestock^GEN MASS / cow^GEN PL
   'The factory processed 200 head of livestock/cows.'

Secondly, speakers report that *štuka, čelovek* and *golova* are degraded in distributive contexts such as reciprocal constructions (87)- (89).

(87) a. pjat' **(??štuk)** graždanskyx samoletov leteli drug za
         five item^GEN PL civil   plane^GEN PL flew on   after
         drugom
         other
         'Five civil planes were flying one after the other.'
      b. #pjat' **štuk**   kuragi   sliplis' drug s
         five item^GEN PL dried apricot^GEN MASS stuck   one with
         drugom
         other
         Intended: 'Five dried apricots stuck one to the other.'

(88) pjat' **(#čelovek)** studentov   spisali drug u   druga
      five person^GEN PL student^GEN PL copied one from other
      otvety
      answers
      'Five students copied the answers one from the other.'

(89) a. pjat' **(?? golov)** korov   ležali drug naprotiv druga
         five head^GEN PL cow^GEN PL lay   one in front other
         'Five cows lay one in front of the other.'
      b. pjat' **(?? golov)** korov   prižalis'   drug k drugu
         five head^GEN PL cow^GEN PL cuddled up one   to other
         'Five cows cuddled up one to another.'

I admit that the decrease in individuation in such constructions is not as strong as in explicit measure constructions with abstract units of measure such as *liter*. Some of my informants accepted some occurrences of *štuka, čelovek* and *golova* with reciprocals, see for example (90).

(90) a. ?pjat' štuk   knig   ležali drug na druge
         five item^GEN PL book^GEN PL lay   one on other
         'Five books were piled on top of the other.'
      b. ?pjat' čelovek   stroitelej   pomogali drug drugu
         five person^GEN PL builder^GEN PL help   one other
         gruzit' kirpič
         load   brick
         'Five builders were helping each other to load bricks.'

This is not totally surprising. In such constructions mass predicates are measured in discrete units which correspond to individual entities and not in abstract units. Therefore such constructions could allow for an interpretation under which the units of measure become antecedents of individuators. In any case, speakers for whom such examples are acceptable still agree that such constructions are not natural. Furthermore, some of my informants stated explicitly that the use of a classifier implies the expression makes reference to a number of objects as a single quantity and that constructions in (90) become worse in distributive contexts like (91) where such an interpretation cannot be derived by any means. This after all supports the hypothesis that these are measure predicates.

(91) pjat' štuk   knig   ležali ?? v   raznyx
      five item^GEN PL book^GEN PL lay   in different room^LOC PL
      komnatax

      'Five books were placed in different rooms.'

vi. Mass complements are rare

As mentioned *štuka, čelovek* and *golova* optionally occur with count nouns but in some cases they are used with naturally atomic mass complements. Count nouns do not require a classifier to be counted. Naturally atomic mass nouns, even though they make reference to entities which come in individuated units grammatically, cannot be counted directly and do require a classifier. If *štuka* and *čelovek* were count/individuating classifiers we would predict them to be more frequent and more natural with naturally atomic mass nouns than with

count nouns. However, exactly the opposite is true. The use of *štuka* is possible but highly restricted with mass nouns. Not every naturally atomic mass noun is a felicitous complement (92).

(92)   # pjat štuk   risa
           five item$^{\text{GEN PL}}$ rice$^{\text{GEN SG MASS}}$

Furthermore, *štuka* is not felicitous even with classical examples of naturally atomic mass nouns such as *furniture* and *footwear*. I encountered a few examples on the Internet (93), but none of my informants (including myself) could confirm that such constructions are felicitous. If *štuka* is an individuating unit classifier, this is very surprising.

(93)   a. ??neskol'ko štuk   brendovoj obuvi
             several   item$^{\text{GEN PL}}$ brand   footwear$^{\text{GEN SG MASS}}$
             'a few items of designer footwear'
       b. ??5 štuk   mebeli
             5 item$^{\text{GEN PL}}$ furniture$^{\text{GEN SG MASS}}$
             'five items of furniture'

These observations also strongly suggest that these items are not counting classifiers used to create grammatically count predicates from naturally atomic mass predicates and that constructions using them do not involve grammatical counting.

vii. Štuka occurs with genuine individuating unit classifiers.

In Russian there is a class of (nominal) individuating unit classifiers which occur with naturally atomic nouns such as *kartofel* 'potato', *malina* 'raspberry' etc. (94) (Isačenko 1960).

(94)   a.   pjat' *(klubnej) kartofelja
            five tuber$^{\text{GEN PL}}$ potato$^{\text{GEN MASS}}$
            'five potato tubers'
       b.   pjat' *(jagod)   maliny
            five berry$^{\text{GEN PL}}$ raspberry$^{\text{GEN MASS}}$
            'five raspberries'

Crucially, we encountered some occurrences of *štuka* in such constructions (95).

(95)   skol'ko štuk   klubnej   kartofelja nado
          how   many item$^{\text{GEN PL}}$ tuber$^{\text{GEN PL}}$ potato$^{\text{GEN MASS}}$
          priobresti…?
          need   purchase
          'How many potato tubers are required…?'

[www.Floraprice.ru/forum/forum1/topic430/]

If *štuka* were an individuating unit classifier whose function is to map mass predicates onto count it would be infelicitous in (95) where this function is fulfilled by an explicit individuator 'tuber'.

     To conclude, the arguments presented in the previous two subsections give a good reason to treat expressions with *štuka, čelovek* and *golova* as measure expressions in which the classifiers introduce a unit of measure. In the following section we offer the compositional interpretation.

5.3. Compositional Interpretation

I propose that *štuka*, *čelovek* and *golova* are measure words which measure sums of entities in terms of natural units. I model the interpretation of these classifiers on measure expressions such as *litr* 'liter' in Rothstein's (2009; in press) and Partee and Borschev's (2012) framework.

A. Syntax

I assume that constructions with *štuka, čelovek* and *golova* have the syntax of measure expressions such as *pjat' litrov moloka* 'five liters of milk' (96). The classifier first combines with the numeral to form a measure phrase, which then modifies a mass predicate expressed by a morphological plural or mass noun.[15]

(96)

NP
|
Meas P   N
| |
Num   Measure N^{GEN}
pjat'   *litrov/štuk/čelovek/golov*
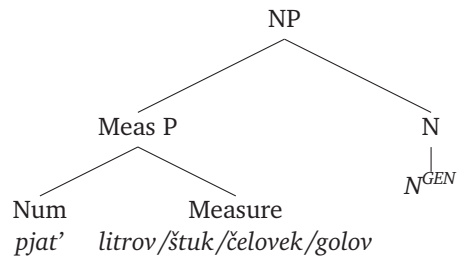
B. Semantics

Štuka, čelovek and *golov,* analogously to measure words such as *litr,* are functions at type <n,<e,t>> from numbers to measure predicates denoting sets of sums of entities which measure n number of units on a dimensional scale, $\lambda n \lambda x.$ MEAS^{DIMENSION}(x) = <n, UNIT> (Landman 2004; Rothstein 2009, 2011, in press; Partee & Borschev 2012). A scale is defined as a triple in (97).

(97)   A **scale** is a triple <D, U, N>:

   • D is a dimension (volume, weight etc)

   • U is the unit in terms of which the scale is calibrated (liters, kilos etc.)

   • N is a set of numbers (the natural numbers, the real numbers etc)

Litr for example is associated with a volume scale calibrated in liter units (98).

(98)   Scale: < VOL,LITER, N>
         ||liter||= $\lambda n \lambda x.$ MEAS^{VOLUME}(x) = <n, LITER UNIT>

I follow Rothstein (in press) in assuming that measuring pluralities in terms of natural/object units involve cardinal scales with an arbitrary dimension (99).[16]

(99)   S= <⊥ , NU, N> :

   • The dimension is arbitrary.

   • Calibration is in terms of Natural Units (NU)

   • N is the set of natural numbers.

Štuka, čelovek and *golov* denote functions at type <n,<e,t>> from numbers to predicates denoting the sets of sums of objects which measure n number of natural units on the cardinality scale. The full compositional derivation of constructions with *štuka, čelovek* and *golov* are presented in (100)-(102). For example, *pjat' štuk jaic* 'five eggs' is interpreted as follows in (100). *Štuk* combines with the numeral *pjat'* to produce a measure predicate denoting the set of sums of objects which measure 5 natural units. *Štuk* introduces a presupposition that the measured N must be inanimate. When *pjat' štuk* combines with a noun *jaic* the presupposition is satisfied. The derived predicate then denotes the set of quantities of eggs which measure 5 natural units. Expressions with *čelovek* and *golova* are interpreted analogously but involve different presuppositions (101)-(102).[17]

(100)   *pjat' štuk jaic* 'five eggs'
         ||five||n = 5
         ||štuk||$_{<n,<e,t>>}$ = $\lambda n \lambda x.$ MEAS(x) = <n, NATURAL UNIT>
                     Presupposition: x ∈ {x: x is inanimate}
         ||pjat' štuk||$_{<e,t>}$ = $\lambda x.$ MEAS (x) = <5, NATURAL UNIT >
                     Presupposition: x ∈ {x: x is inanimate}
         ||jaic||$_{<e,t>}$ = $\lambda x.$ EGG(x)
         ||pjat' štuk jaic||$_{<e,t>}$ = $\lambda x.$ EGG(x) ∧ MEAS (x) =
         <5, NATURAL UNIT>
         Paraphrase: The set of pluralities of eggs whose measure value is 5 on the cardinality scale calibrated in natural units

(101)   *pjat' čelovek stroitelej* 'five builders'
         ||five||n = 5
         ||čelovek||$_{<n,<e,t>>}$ = $\lambda n \lambda x.$ MEAS(x) = <n, NATURAL UNIT>
                     Presupposition: x ∈ {x: x is human}
         ||pjat' čelovek||$_{<e,t>}$ = $\lambda x.$ MEAS (x) = <5, NATURAL UNIT>
                     Presupposition: x ∈ {x: x is human}
         ||stroitelej||$_{<e,t>}$ = $\lambda x.$ BUILDER(x)
         ||pjat' čelovek stroitelej||$_{<e,t>}$ = $\lambda x.$ BUILDER(x) ∧ MEAS(x)
         = <5, NATURAL UNIT>
         Paraphrase: The set of pluralities of builders whose measure value is 5 on the cardinality scale calibrated in natural units

(102) *pjat' golov korov* 'five cows'
       $\|five\|n = 5$
       $\|golov\|_{<n,<e,t>>} = \lambda n\lambda x.$ MEAS(x) = <n, NATURAL UNIT>
                  Presupposition: x ∈ {x: x is a farm animal}
       $\|pjat'\ golov\|_{<e,t>} = \lambda x.$ MEAS (x) = <5, NATURAL UNIT>
                  Presupposition: x ∈ {x: x is a farm animal}
       $\|korov\|_{<e,t>} = \lambda x.$ COW(x)
       $\|pjat'\ golov\ korov\|_{<e,t>} = \lambda x.$ COW(x) ∧ MEAS (x) = <5, NATURAL UNIT>
       Paraphrase: The set of pluralities of cows whose measure value is 5 on the cardinality scale calibrated in natural units

In the proposed analysis *štuka, čelovek* and *golova* instantiate an operation similar to that proposed in Krifka (1989, 1995). However, the presented account differs from Krifka's proposal in two respects:

(i) Krifka (1995) assumes that complements in measure constructions denote kinds and analyzes measure classifiers at type $<\boldsymbol{k},<n,<e,t>>>$. We saw that *štuka*, *čelovek* and *golova* take predicates and not kind-denoting complements. I thus followed Landman (2004); Rothstein (2009) and Partee & Borschev (2012) in assuming that measure words denote functions from number to predicates, i.e. $<n,<e,t>>$. Such an analysis is also different from Krifka's (1989) proposal in which measure words are inherently heads of modifiers at type $<n,<<e,t>,<e,t>>>$.

(ii) Krifka (1989, 1995) does not distinguish counting and measuring. In his analysis measuring in terms of natural units is in fact counting. We saw that in Russian counting and measuring are different operations. I argued that measuring in terms of natural units/cardinalities indeed occurs in *pjat' golov korov* but not in *pjat' korov* which involves genuine counting of atoms. Crucially, measuring in terms of cardinalities is still different from counting. Counting involves accessing the internal structure of atomic pluralities and identifying how many atoms each sum has. This requires individuating the denotation in terms of atoms. Measuring in terms of cardinality involves assigning a value to an overall quantity of naturally atomic objects without necessarily individuating the atoms.

6. CONCLUSION

The paper explored a subclass of optional classifiers *štuka, čelovek* and *golova*. We saw that these classifiers are different from nominal classifiers such as *kusok* 'piece' or *butylka* 'bottle'. They form a closed set of functional expressions and, prima facie, look very much like counting unit (sortal) classifiers in Mandarin. I showed that apparently count constructions using these classifiers in fact have properties of measure predicates. Given that, I argued that *štuka, čelovek* and *golova* are not individuating operators but are measure words which measure predicates in terms of natural units.

Notes

[1] This paper is based on chapter 5 of my dissertation "Numerous Issues in the Semantics of Numeral Constructions in Russian" submitted to Bar Ilan University in October 2016.

[2] Although Rothstein (in press) suggests that in English *head* in *five head of cattle* is possibly a sortal classifier

[3] Rothstein (2010, in press)) argues that atomicity is encoded in the grammatical structure of count nouns. On her account mass nouns are interpreted as type <e,t> and denote plural individuals with partially specified atoms whereas count nouns are interpreted at type <e×k, t> and denote sets of individuals which count as atoms in a given context k. This view is adopted in Li's (2013) and Li & Rothstein's (2012) analyses of counting expressions in Mandarin. In this paper, however, I use simplified representations in which both mass and count predicates are interpreted at type <e,t>.

[4] This is a simplified representation. As mentioned, in Rothstein's (2010; in press) framework mass and count predicates are interpreted at different types, <e,t> and <e×k,

t> respectively. Counting classifiers are then interpreted at type $<<e\alpha,t>, <e\times k,t>>$, i.e. as functions from count or mass predicates to count predicates.

[5]PL(P) stays for plural predicates, i.e. the set P closed under sum in the sense of Link (1983).

[6]I use $^\cup$ operation from Chierchia (1998) in my representation. Krifka (1995) uses $\lambda x.R(x,\boldsymbol{k})$, meaning the set of individuals such that they belong to the kind $\boldsymbol{k}$.

[7]One of the reviewers pointed out that (23c) may have a felicitous use but then the example will have a different interpretation. Indeed some speakers suggest that (23c) is marginally acceptable assuming that *golova* is interpreted as a noun referring to a body part and not as classifier designating a unit, i.e. the farmer bought five actual cow heads instead of buying five cows. Not all speakers agree that such an interpretation is available though. In any case we will discuss the differences between a nominal and classifier uses of *golova* in section *iii*.

[8]In colloquial speech *štuka* can be used with animate nouns (e.g *pjat' štuk gusej* 'five geese').

[9]When a nominal *čelovek* is modified by a numeral or appears in the scope of *neskol'ko* 'several' it can have either form p*jat' čelovek/ljudej, neskol'ko čelovek/neskol'ko ljudej* 'five/ several people'. There may be a certain difference in meaning though.

[10]Not all adjectives are equally acceptable as modifiers of classifiers.

[11]Also, one of the reviewers suggested that the fact that *piece* in (36b) takes a diminutive suffix is potentially further evidence that this classifier is nominal. Prima facie this is correct, since we would not expect diminutives to apply to functional expressions. However I encountered some examples in which diminutives appear on *štuka* classifier (e.g. *otdam za pjat' štuček*[DIM] *šokoladnyx jaic* 'will exchange for five chocolate eggs' [https://m.ok.ru/group52102142165168/topic/65643119064496]. I will not elaborate on this issue here since the semantics of diminutives in Russian is a very complex topic going far beyond the scope of this paper (see Khrizman (work in progress)).

[12]Yadroff offers a syntactic analysis in which he argues that *štuka* and *čelovek* express [+count] feature merged in the functional Meas P projection of nouns. In the absence of these classifiers the category stays phonologically empty.

[13]Cf. Krifka (1989); Rothstein (2010).

[14]Mel'čuk points out that it is possible to drop the numeral if the measure word is singular *metr sitca* 'a meter of calico'. A possible explanation could be that such constructions involve a null determiner. Also, Mel'čuk gives a few examples showing that classifier constructions without numerals are possible in list contexts [Mel'čuk 1985:69]:

(1) on pokupal metry citca, kilogrammy bumagi, vedra kleja- no emu
    he bought meter[ACC PL] calico, kilo[ACC PL] paper, bucket[ACC PL] glue- but him

    vsego bylo malo
    all was not much

    'He bought meters of calico, kilos of paper, buckets of glue- but all this was not enough for him.'

[15]For alternative proposals on the syntax of numeral (measure) classifier constructions see Landman (this volume) for English, Matushansky (2015); Matushansky & Ruys (2015a); Yadroff (1999) for Russian.

[16]Rothstein suggests that measuring in terms of cardinalities occurs in constructions which compare quantities expressed by object mass nouns such as *furniture* in terms of their cardinalities/object units instead of weight or volume (e.g. M*ary has more furniture*

than John. She has three small chairs and a table. John has one big chair and a table). Rothstein analyzes such cardinal comparisons as involving a measure function which maps a quantity of naturally atomic objects to the value on a cardinal scale which reflects the number of their atomic parts.

[17]I adopt Rothstein's (2011) semantics for measuring and assume that morphologically count plural complements in (100)-(102) shift to a mass interpretation, i.e. denote sets of non-atomic pluralities. An alternative proposal would be that these constructions involve measuring of count plural denotations (grammatically atomic pluralities). Working out the details of this proposal is beyond the scope of this paper.

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