Making sense of variable number agreement in Russian

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Abstract: In this paper, we focus on Russian quantified noun phrases that are known to be able to trigger plural verbal agreement or no agreement at all. Descriptively, we offer a novel generalization: when such phrases trigger plural verbal agreement, they cannot be interpreted in the immediate scope of negation. We show that this generalization falls out if these plural-agreeing phrases are treated in semantics as individual-denoting choice-functional indefinites and not as generalized quantifiers. Theoretically, we speculate that interpretable number features are in principle incompatible with generalized quantifier denotations.

Keywords: agreement, negation, number, quantitative constructions, reference, Russian, syntax

К осмыслению вариативного числового согласования в русском языке

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Аннотация: В фокусе статьи русские количественные именные группы, которые, как известно, могут вызывать предикативное согласование по множественному числу или не вызывать согласования вовсе. С описательной стороны мы предлагаем следующее обобщение: когда такие группы вызывают согласование по множественному числу, они не могут быть проинтерпретированы в непосредственной сфере действия отрицания. Мы показываем, что это обобщение получает объяснение, если принять, что согласующиеся по множественному числу группы имеют индивидные денотаты, полученные с помощью функций выбора. Их денотатами не могут быть обобщенные кванторы. С теоретической стороны мы предлагаем считать, что интерпретируемые признаки числа принципиально несовместимы с кванторными денотатами.

1. Introduction: Variable number agreement with QPs in Russian

There are many expressions in Russian that, when used as subjects, are compatible with variable number agreement on the main predicate. Here we focus on those expressions that either trigger plural verbal agreement or trigger no verbal agreement at all, which results in the verb appearing with default morphological features, i.e. person: 3, number: singular, gender: neuter. Such expressions consist of a nominal part and a part containing a numeral, possibly modified, or some other degree expression like *mnogo* 'many' or *malo* 'few'. Some examples are provided below:[1]

(1)   a.   *Na kurs zapisalis'*   [*dvadcat' dva studenta*].
              on   course   registered.**PL**   twenty   two   students

       b.   *Na kurs zapisalos'*   [*dvadcat' dva studenta*].
              on   course   registered.**3SG.N**   twenty   two   students
              'Twenty-two students registered for the class.'

(2)   a.   *?Na ego sčetax v banke ostavalis'*   [*bol'še pjati vkladov*].
              on   his   accounts   in   bank   remained.**PL**   more.than   five   deposits

       b.   *Na ego sčetax v banke ostavalos'*   [*bol'še pjati vkladov*].
              on   his   accounts   in   bank   remained.**3SG.N**   more.than   five   deposits
              'There were more than five deposits remaining on his bank accounts.'

(3)   a.   *Vo vremja eë pravlenija v Gruzii*
              in   time   of.her   rule   in   Georgia
              byli postroeny mnogo krasivyx xristianskix xramov.
              were.**PL**   built.**PL**   many   beautiful   Christian   temples
              'Many Christian temples were built in Georgia during her rule.'
              (https://news.rambler.ru/caucasus/39608233-kto-krestil-chechentsev)

       b.   *Vo vremja eë pravlenija v Gruzii*
              in   time   of.her   rule   in   Georgia
              bylo postroeno mnogo krasivyx xristianskix xramov.
              were.**3SG.N**   built.**3SG.N**   many   beautiful   Christian   temples

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[1] We use these examples as baseline sentences (further to be modified with negation) showing principal availability of non-agreeing and plural-agreeing strategies. The acceptability of sentences (2a) and (3a) may be degraded (for some speakers) as compared to (2b) and (3b), respectively. Note, however, that (3a) is a real occurrence on the internet, and (2a) is modelled on real occurrences.

The internal and external syntax of such expressions has been thoroughly studied in [Franks 1994; Franks, Pereltsvaig 2004; Lyutikova 2010; 2015; Pereltsvaig 2006; 2007; Pesetsky 1982] and other works. While we believe that important results have been achieved there, we will not be very precise about the syntactic composition of such phrases in terms of projections of particular heads, etc. However, there are two syntactic ideas that seem to be compatible with different theories that will be important for us here. First, it is an idea that those expressions that co-occur with default verbal agreement **do not have agreement features** that could be "visible" to the verb. Second, it is an idea that those of these expressions that trigger verbal agreement do have a plural number feature that is not projected from any of their internal lexical elements.

— As for the first idea, it fits well with the common reasoning about how syntactic agreement should work that could be found, e.g., in [Preminger 2014]. Syntactic agreement in the simplest case is essentially an obligatory rule of valuation of unvalued features. It is formalized in a system where a probe with an unvalued feature (in our case, the head T, which is eventually spelled-out and linearized as an agreement suffix) searches its c-command domain for a goal that has a corresponding valued feature. If such a goal is found, the structural description of the rule is met, and the value of the goal becomes the value of the probe. If such a goal is not found, the feature on the verb stays unvalued and is eventually spelled out with morphological default.

In our case, focusing on the number feature, there seem to be no reasons to believe that any of the singular features we see on the verbs in (1b), (2b) or (3b) has any corresponding singular feature on the subject. Even if we assume that there is a singular feature on the subject, it is hardly an interpretable feature (since these subjects denote pluralities). A simpler theory would say that the subjects in these examples do not have any number features for the verb to agree with, and this is why the verbs take default values. This is just as should be expected in a system like Preminger's [2014].

— The second idea also shouldn't count as too controversial. Since the verbs in (1a), (2a) and (3a) appear in the plural form, which is not the morphological default, it must be a result of syntactic agreement with the subject, so the subject must have a plural feature.

It is not obvious, however, where this feature could come from. It is hardly from the nominal part of the expression. These nominal parts may have formal plural features (not necessarily, though, see (1a) for a singular noun form as the nominal part), but they do not seem to be syntactic heads of these expressions, and therefore we should not expect their features to project.

Could it be that these plural features are projected by the numeral/degree element? In principle, we cannot exclude this possibility, but we do not have any reliable external evidence for this position. Besides, if it were the case that numeral/degree elements in the a-examples in (1)–(3) trigger verbal agreement, they are not predicted to fail to do so in the b-examples. At best, one could say that these elements project plural features optionally.

Again, we opt for a simpler view whereby agreeing subjects in (1a), (2a) and (3a) have number features that are not projected from any lexical element of these expressions. It could be, for example, that they contain specialized unpronounced functional heads hosting interpretable number features (cf. [Sauerland 2003] and others on interpretable number features, see Section 4 for elaboration). These functional heads are absent in the subjects of the b-sentences, and this is why they do not trigger verbal agreement.

To save some ink, throughout the paper we will use the abbreviations PL-QPs (plural QPs) for QPs triggering plural verbal agreement and SN-QPs (small nominal QPs) for QPs that do not trigger verbal agreement.

Since our paper deals with differences between PL-QPs and SN-QPs in their potential to take semantic scope, before we proceed, a couple of words of caution are in order:

— There have been many claims about semantic differences between PL-QPs and SN-QPs in the literature. We do not think that all of them are true. For example, in [Pereltsvaig 2006: 443] it is claimed that "only agreeing subjects can take wide scope with respect to negation, whereas nonagreeing subjects obligatorily take narrow scope". Our examples will often show otherwise (see also [Barkova 2023] for experimental evidence that PL-QPs and SN-QPs are not that different in their potential to take wide scope with respect to universal quantifiers).

— We will eventually show that PL-QPs are not truly quantificational and thus we cannot meaningfully talk about their semantic scope. However, before we formulate our analysis, we will often talk about the scope of PL-QPs. This is mainly for the ease of exposition. Whenever we say that a PL-QP takes a certain scope, it should be taken to mean that some sentence is interpreted **as if** the PL-QP contained in it were quantificational and took that scope.

　Or else we may say that we start from a null hypothesis that both PL-QPs and SN-QPs can be quantificational and then eventually refute it.

In what follows we will proceed to our main empirical finding showing that **PL-QPs do not take scope immediately under negation**, although they may scope under other operators, even when those operators themselves scope under negation (Section 2). Then, in Section 3, we argue that despite their inability to take scope under negation, PL-QPs are not run-of-the-mill positive polarity items. After that, in Section 4, we demonstrate that the scopal properties of PL-QPs fall out if they denote not generalized quantifiers, but choice-functional individuals that are equipped with interpretable number features. A semantics for these number features is to be found in Section 5. Section 6 presents a discussion of the main findings and some speculations about semantic type compatibility of number. In Section 7, we identify a class of potential counterexamples to our main scope generalization, arguing that they may be cases of homogeneity violations.

2. PL-QPs do not take scope under negation

The main generalization that we present in this paper is that **indefinite PL-QPs cannot be interpreted in the immediate scope of negation**. We will discuss some examples that make it clear. Here is one of the minimal pairs that could illustrate this point.

(4)　a. *Vo　vremja　eë　pravlenija　v　Gruzii*
　　　　in　time　of.her　rule　in　Georgia

　　　　ne　bylo　postroeno　mnogo　krasivyx　xristianskix　xramov.
　　　　not　was.**3SG.N**　built.**SG.N**　many　beautiful　Christian　temples
　　　　'Not many Christian temples were built in Georgia during her rule.'
　　　　(lit. "Many Christian temples were not built in Georgia during her rule.")

　　　b. [#/??]*Vo　vremja　eë　pravlenija　v　Gruzii*
　　　　in　time　of.her　rule　in　Georgia

　　　　ne　byli　postroeny　mnogo　krasivyx　xristianskix　xramov.
　　　　not　were.**PL**　built.**PL**　many　beautiful　Christian　temples

Recall the baseline sentences without negation, where both PL-QPs and SN-QPs were more or less fine, at least for some speakers (3). We believe that the reason why (4b) feels anomalous or almost ungrammatical is that *mnogo krasivyx xristianskix xramov* 'many beautiful Christian churches', agreeing in plural, is hard to intepret in the scope of negation. If 'many churches' outscoped negation, it would at best mean that there were many churches that could have been built,

but were not.[2] This is not the interpetation that is easily available for (4a), which just states that not many churches were built (*not > many*). The same point can be made using sentences with contrastive topics that are known to enforce scope inversion (see [Büring 1995; 2016]).

(5) a. [?]*[MNÓGO*   *moskvičej*]   *na   prizyv   ne   otklìknulos'.*
         many   Muscovites   on   call   not   answered.**3SG.N**
         'It is not the case that many Muscovites answered the call.'

     b. [#/*]*[MNÓGO*   *moskvičej*]   *na   prizyv   ne   otklìknulis'.*
         many   Muscovites   on   call   not   answered.**PL**

If (5a) is read with a contrastive topic intonation (a pitch rise on *mnogo* 'many' and a fall on the verb), it receives a reading where 'many' takes scope under negation ('not many Muscovites answered the call'). In contrast, when (5b) is read with the same intonation, it sounds ungrammatical. We believe this is because this very intonation ensures the scope of the QP under negation, which is incompatible with a PL-QP in (5b).

The inability to take scope under negation is also characteristic of PL-QPs with (modified) numerals:

(6) a. *Na   ego   sčetax   v   banke   ne   ostavalos'*   [*bol'še   pjati   vkladov*].
         on   his   accounts   in   bank   not   remained.**3SG.N**   more.than   five   deposits
         'There were not more than five deposits remaining on his bank accounts.'

     b. **Na   ego   sčetax   v   banke   ne   ostavalis'*   [*bol'še   pjati   vkladov*].
         on   his   accounts   in   bank   not   remained.**PL**   more.than   five   deposits

For the sentences in (6) to make sense, the subject *bol'še pjati vkladov* 'more than five deposits' has to be interpreted in the scope of negation. Otherwise, they would assert the existence of over five deposits that are not left on someone's bank accounts. It should come as no surprise by now that only the variant with a SN-QP (6a) is fully acceptable. The variant with a PL-QP (6b) is ungrammatical, pointing to the impossibility of PL-QPs scoping under negation.

Finally, a piece of evidence for the same generalization comes from the distribution of PL-QPs and SN-QPs containing negative polarity items (NPI), like *i* 'even' in the examples below. The context facilitates the reading where *i desjat' studentov* 'even ten students' scopes below negation ('not even ten students enlisted', and that is not enough for the class to take place), but this reading is only compatible with a SN-QP in (7a), while the variant with a PL-QP (7b) is at best pragmatically odd, with *i* interpreted not as a negative polarity 'even' but rather a positive polarity 'also', thus, not in the scope of negation.

(7) *Kurs   budet   pročitan,   esli   zapišutsja   xotja by   dvadcat'   studentov.*
     class   will.be   read   if   register   at least   twenty   students
     'The class will take place if at least twenty students register for it.'

     a. *Na   nastojaščij   moment   ne   zapisalos'*   *i*   *desjat'   studentov.*
         on   present   moment   not   registered.**3SG.N**   even   ten   students
         'As of now, not even ten students registered.'

     b. [#]*Na   nastojaščij   moment   ne   zapisalis'*   *i*   *desjat'   studentov.*[3]
         on   present   moment   not   registered.**PL**   even/also   ten   students

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[2] The use of a creation predicate ensures that 'many churches' outscoping negation cannot refer to actual churches.

[3] An anonymous reviewer suggests a following example, found in the Russian National Corpus (https://ruscorpora.ru/), to falsify the claim about the impossibility of *i*-modified PL-QPs to be interpreted in the immediate scope of negation:

(i) *Bylo   jasno,   čto   prišedšix   ne   vmestjat   i   četyre   dvorca   kul'tury.*
     was   clear   that   those.who.came   not   will.hold.**PL**   even   four   palaces   of.culture
     'It was clear that even four culture palaces won't hold those who came.' [A. Makarevich, *Vsë očen' prosto*, 1990]

Havng established that PL-QPs cannot be interpreted in the immediate scope of negation,[4] we should note that it is not the case that PL-QPs cannot be scoped over by any operators. It has been shown in [Barkova 2023] that PL-QPs and SN-QPs are not that different in their potential to take scope above or below universal quantifiers with *každyj* 'every'. Similarly, **SN-QPs and PL-QPs alike are free to take scope under modal operators**.

For example, in (8) both the variant with a SN-QP (8a) and the variant with a PL-QP in (8b) allow for interpretations where the indefinite *kak minimum tri vrača* 'at least three doctors' is interpreted non-specifically in the scope of the necessity modal *dolžen* 'must', whether it is understood deontically or epistemically.

(8) a. | *V* | *operacionnoj* | *dolžno* | *prisutstvovat'* | *kak minimum* | *tri* | *vrača.* |
     |---|---|---|---|---|---|---|
     | in | operating.room | must.**3SG.N** | be.present | at least | three | doctors |

    b. | *V* | *operacionnoj* | *dolžny* | *prisutstvovat'* | *kak minimum* | *tri* | *vrača.* |
     |---|---|---|---|---|---|---|
     | in | operating.room | must.**PL** | be.present | at least | three | doctors |

    'There must be at least three doctors in the operating room.'

Similarly, both variants in (9) allow for non-specific interpretations of the indefinite in the scope of the possibility modal *možet* 'may', again, regardless of its modal flavor, although an epistemic reading may be preferred here.

(9) a. | *V* | *ètot* | *moment* | *v* | *kvartire* | *moglo* | *naxodit'sja* | *do* | *desjati* | *čelovek.* |
     |---|---|---|---|---|---|---|---|---|---|
     | in | this | moment | in | apartment | may.PST.**3SG.N** | be.present | up.to | ten | people |

    b. | *V* | *ètot* | *moment* | *v* | *kvartire* | *mogli* | *naxodit'sja* | *do* | *desjati* | *čelovek.* |
     |---|---|---|---|---|---|---|---|---|---|
     | in | this | moment | in | apartment | may.PST.**PL** | be.present | up.to | ten | people |

    'It is possible that up to ten people were in the apartment at this moment.'

Interestingly, PL-QPs may take scope under modal operators even when those operators themselves appear under the scope of negation. For example, both (10a), with a SN-QP, and (10b), with a PL-QP, allow for a non-specific interpretation, according to which it must be the case that the number of people in the cockpit was three or less. This corresponds to a logical form where negation takes scope over the possibility modal, which, in turn, takes scope over the indefinite (*not > may > more than three*).

(10) a. | *V* | *kabine* | *pilota* | *ne* | *možet* | *naxodit'sja* | *bol'še* | *trëx* | *čelovek.* |
     |---|---|---|---|---|---|---|---|---|
     | in | cockpit | pilot's | not | may.**3SG** | be.present | more.than | three | people |

    b. | *V* | *kabine* | *pilota* | *ne* | *mogut* | *naxodit'sja* | *bol'še* | *trëx* | *čelovek.* |
     |---|---|---|---|---|---|---|---|---|
     | in | cockpit | pilot's | not | may.**3PL** | be.present | more.than | three | people |

    'It may not be the case that there are more than three people in the cockpit.'

(Footnote 3 continued.) We agree that this is a perfectly grammatical sentence, but we believe that such examples may involve a covert modal operator (here, the verb *vmeščat'* 'hold' seems to mean roughly 'to be able to contain'; a modal component explains why free choice items like *ljuboj* 'any' are licensed under *vmeščat'*; see also [Padučeva 2004: 388] claiming semantic equivalence of *vmeščaet* 'holds' and *možet vmestit'* 'can hold'). If so, we are dealing with an interpretational sequence *not > modal > PL-QP*. Such sequences are valid and discussed further down in the present section.

[4] While throughout the paper we take it to be a categorical claim, we admit that it could be possible that the actual picture is more nuanced. Once a significant number of speakers is tested in a controlled experiment, it may turn out that their judgments are less categorical than we make them seem. For readers disagreeing with our generalization about the scopal possibilities of PL-QPs, we could suggest a milder statement: it is harder to interpret PL-QPs in the immediate scope of negation than to do so for SN-QPs. If this formulation turns out to be closer to reality, the economy principle that we argue for in Section 6 should also be taken as a tendency rather than a rule.

The examples in (11) illustrate the same point. The most natural interpretation of (11a), with a SN-QP, and (11b), with a PL-QP, is the one where the speakers' desired worlds are the ones where not many people live below the poverty line. In the logical form, negation takes scope over the attitude predicate *xotim* '(we) want', which, in turn, takes scope over the indefinite *mnogo semej* 'many families' (*not > want > many*).

(11) a. *My   ne   xotim,   čtoby   mnogo   semej   okazalos'   za   čertoj   bednosti.*
          we   not   want   that   many   families turned.out.**3SG.N** behind line   of.poverty

      b. *My   ne   xotim,   čtoby   mnogo   semej   okazalis'   za   čertoj   bednosti.*
          we   not   want   that   many   families turned.out.**PL**   behind line   of.poverty

          'We don't want many families to fall below the poverty line.'

We can conclude from this evidence that it is not the case that PL-QPs cannot take scope under negation at all. If there is an intervening non-negative operator between negation and a PL-QP (*not > Op > PL-QP*), the scope sequence is fine. We will argue that this is a characteristic property of choice functions and, consequently, that PL-QPs should be analyzed as choice-functional indefinites. Before doing that, we will show that, despite their inability to appear in the immediate scope of negation, PL-QPs should not be analyzed as positive polarity items (PPIs).

3. PL-QPs are not PPIs

We can take PPIs to be elements that are normally not licensed in the scope of negation (or, more broadly, anti-additive or downward-monotone operators). We can use the Russian pronoun *kto-to* 'someone' as a specimen of a PPI:

(12) *Vasja   kogo-to   ne   videl   /   ne   videl   kogo-to.*
       Vasja   someone   not   saw   not   saw   someone
       'Vasja didn't see someone.'   ∃ > *not*
       *'Vasja didn't see anyone.'   **not* > ∃

Just as PL-QPs, the pronoun *kto-to* seems to be not licensed in the scope of negation. Would it be correct and/or insightful, then, to characterize PL-QPs as PPIs? We believe that it won't be truly insightful unless we have a clear understanding of **why** PPIs are not licensed under negation. However, before even going there, we can show that PL-QPs are different from run-of-the-mill PPIs in their distribution.

In [Szabolcsi 2004] it has been demonstrated that in various languages PPIs tend to be licensed under anti-additive operators, including negation, if these operators themselves appear in anti-additive or downward-entailing environments, i.e. contexts that license negative polarity items (NPIs). Here is how Szabolcsi [2004: 419] puts it in her paper: "PPIs do not occur in the immediate scope of a clausemate antiadditive operator AA-Op, unless [AA-Op > PPI] itself is in an NPI-licensing context". This property of NPI-licensing contexts is called **rescuing**, and we can see that the Russian PPI *kto-to* can be "rescued" like that. The example below is modeled on one of Szabolcsi's original examples ([Ibid.: 418], example (37)) used to demonstrate the effect of "rescuing".

(13) *Esli   my   ne   vyzovem   kogo-to,   my   obrečeny.*
       if   we   not   call   someone   we   are.doomed
       'If we don't call someone (≈ anyone), we are doomed.'   *if > not > ∃*

The example allows for (and maybe even favors) a reading where *kto-to* is interpreted in the scope of negation, but (13) is crucially different from (12) in that the negation itself is in an NPI-licensing context, namely in an antecedent of a conditional.

PL-QPs cannot be rescued the way PPIs can. Consider the example below which also contains negation inside the antecedent of a conditional, but it does not help the PL-QP to be licensed in the immediate scope of negation.

(14) *Esli   na   èkzamen   ne   prišli   bol'še   desjati   studentov,*
      if   on   exam   not   come.**PL**   more.than   ten   students

      èkzamen   sčitaetsja   nesostojavšimsja.
      exam   counts   not.taken.place

      'If more than ten students did not come, the exam counts as not taken place.'
         if > more than 10 > not
         *if > not > more than 10

The sentence in (14) does not have a reading where the PL-QP *bol'še desjati studentov* is interpreted in the scope of negation ('if the exam is attended by ten or less students, it counts as not taken place'). The reading where the PL-QP *bol'še desjati studentov* is interpreted above negation ('if there are more than ten students who don't come to the exam, it counts as not taken place') is available, and this is just as expected if the generalization that PL-QPs are not licensed in the immediate scope of negation does hold.[5]

We conclude that, since PL-QPs do not show one of the characteristic properties of standard PPIs, they should not be treated as such. Now we can proceed to their proper treatment.

4. PL-QPs are choice-functional indefinites

What we have learned so far is that PL-QPs cannot appear in the immediate scope of negation and that they cannot be rescued PPIs. Now we would like to suggest that their inability to take scope immediately below negation suggests that they are not truly scope-taking elements. In semantics, PL-QPs are not generalized quantifiers (type $<<e,t>,t>$). They denote individuals (type e) derived with the help of choice functions, and their seeming ability to scope under some operators is a reflex of Skolem arguments that these choice functions contain and that can be bound by some operators, but crucially not by negation.

Let us now unpack our argument. Following much of the literature (see [Bylinina, Nowen 2020] and references therein), let us assume that QPs at their core are combinations of a predicate of individuals and a degree expression. These complex predicates can in turn combine with (covert) existential quantifiers (type $<<e,t>,<<e,t>,t>>$) to yield generalized quantifiers:

(15) $QP_{<<e,t>,t>}$
      $\lambda P. \exists x\ [\#x = 5\ \&\ apple(x)\ \&\ P(x)]$
      $\lambda P. \exists x\ [\#x < 5\ \&\ apple(x)\ \&\ P(x)]$
      $\lambda P. \exists x\ [\#x > standard\ \&\ apple(x)\ \&\ P(x)]$

      $\exists_{<<e,t>,<<e,t>,t>>}$ $<e,t>$
                             $\lambda x.\ \#x = 5\ \&\ apple(x)$
                             $\lambda x.\ \#x < 5\ \&\ apple(x)$
                             $\lambda x.\ \#x > standard\ \&\ apple(x)$

      pjat' '5'$_{<e,t>}$ *jablok* 'apples'$_{<e,t>}$
      men'še pjati 'less than 5'
      mnogo 'many', etc.

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[5] Note that a corresponding sentence with a SN-QP (*Esli na èkzamen ne prišlo bol'še desjati studentov, èkzamen sčitaetsja nesostojavšimsja*) does have a reading where negation scopes above the modified

In addition to this option, we suggest that there is another one where instead of an existential quantifier a choice function (type $\langle\langle e,t\rangle,e\rangle$) is used. The expression as a whole denotes an individual.[6]

(16) QP_e
the individual x picked by the CF such that $\#x = 5$ & apple(x)
                                               $\#x < 5$ & apple(x)
                                               $\#x >$ standard & apple(x)

$CF_{\langle\langle e,t\rangle,e\rangle}$ $\langle e,t\rangle$
                       $\lambda x. \#x = 5$ & apple(x)
                       $\lambda x. \#x < 5$ & apple(x)
                       $\lambda x. \#x >$ standard & apple(x)

pjat' '5'$_{\langle e,t\rangle}$ *jablok* 'apples'$_{\langle e,t\rangle}$
men'še pjati 'less than 5'
mnogo 'many' etc.

We will assume the analysis of choice functions in [Kratzer 1998] (see [Yanovich 2005] where this analysis is applied to Russian indefinite pronouns) whereby they do not need to be introduced by an existential quantifier, as in some other accounts (cf. [Reinhart 1997; Winter 1997]). Choice-functional indefinites are essentially variables that can be free (which gives rise to "wide scope" readings) or bound ("narrow scope" readings). Binding becomes possible if choice functions are decomposed as functions of type $\langle\tau, \langle\langle e,t\rangle,e\rangle \rangle$ that take Skolem arguments of type τ, where τ can be a type of individuals, possible worlds, events, etc.

(17)   CF

$f_{\langle\tau,\langle\langle e,t\rangle,e\rangle\rangle}$ $Skolem_\tau$

For example, in (8b), to get a reading where the PL-QP *kak minimum tri vrača* 'at least three doctors' seemingly takes narrow scope with respect to the necessity modal, we assume that the modal is a universal quantifier over possible worlds and that the world Skolem argument is bound by that quantifier. This would mean that the choice function may pick up different individuals in different worlds from the deontic modal base (i.e. the worlds where the regulations imposed in the actual world hold), giving an illusion of narrow scope of the indefinite with respect to the modal.

Negation is certainly not an operator that could bind a Skolem argument. This is why when a choice-functional individual is c-commanded by negation without any potential Skolem binders intervening, the illusion of an existential quantifier taking narrow scope with respect to negation won't arise.

However, the situation is predicted to be different when there is an operator that could bind a Skolem argument between the negation and the CF-indefinite (*not > Op > CF*). If the operator does bind the CF Skolem argument, it would appear as if an existential quantifier scopes under the operator which, in turn, scopes under negation.

This is what happens in (10b), for instance. Take a deontic reading, on which it was required by the existing regulations that there are not more than three people in the cockpit. We can derive this reading with a help of a choice function with a Skolem argument bound by the modal operator (18).

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numeral: *if > not > more than 10*. Taken as a rule on this reading, it would force the instructors to cancel exams that are attended by ten or less students.

[6] In reality, these are not the only possible denotations. There are degree readings of variable agreement QPs in Russian as well (see [Matushansky, Ruys 2015a; 2015b]), whose discussion we postpone for a future occasion.

(18) There is no world w' where regulations imposed in the actual world hold such that the individual that the choice function F returns in w' is in the cockpit in w' has a cardinality of more than 3 in w'. =
In every world w' where regulations imposed in the actual world hold, the individual that the choice function F returns in w' is in the cockpit in w' does not have a cardinality of more than 3 in w'.

At the same time a roughly equivalent reading could be derived with an existential quantifier taking lowest scope:

(19) There is no world w' where regulations imposed in the actual world hold such that there is an individual whose cardinality is more than 3 and who is in the cockpit in w'. =
In every world w' where regulations imposed in the actual world hold, there was no individual whose cardinality is more than 3 in w' and who is in the cockpit in w'.

Such near-equivalencies are what may give rise to an illusion that a choice-functional QP takes scope under negation. To emphasize again, this is only possible when there is an intervening operator that binds the Skolem argument.

Turning to seemingly different scopal properties of SN-QPs and PL-QPs that we observed in Section 2, we can now see they are exactly what we should predict if PL-QPs allow for the CF construal (16), but not for the quantificational construal (15).

This analytical step has consequences beyond what we have already observed. For example, it is predicted that just like any other choice-functional indefinites, and, unlike true quantifiers, PL-QPs are not subject to scope islands (see [Kratzer 1998; 2002; Yanovich 2005], among others). This prediction is indeed borne out for PL-QPs. Consider the sentence in (20).

(20) *Učitel'nica   russkogo   budet   rada,   esli   eë   učenikami*
teacher   of.Russian   will.be   happy   if   her   by.students

ne   budut   dopuščeny   rovno   dva   tipa   ošibok.
not   will.be.**3PL**   made.**PL**   exactly   two   types   of.mistakes

'The teacher of Russian will be happy if exactly two kinds of mistakes are not made by her students.'   *exactly 2 > if*

The most salient reading of (20) is the one on which the teacher of Russian has exactly two types of mistakes in mind and she will be happy if her students do not make mistakes of (any of) those two types. This is a reading where the indefinite PL-QP *rovno dva tipa ošibok* 'exactly two kinds of mistakes' seems to take scope outside of the subordinate clause, the antecedent of a conditional, a classic scope island. In Kratzer's terms, though, this is not true scope, but rather **pseudo-scope**. Under a choice-functional analysis, the PL-QP denotes an entity consisting of exactly two types of mistakes, and the choice function picks exactly two kinds of mistakes (for example, the ones the teacher spent most time teaching to avoid) out of all of the kinds of mistakes that could be made.

The sentence in (20) hardly has a reading whereby the teacher will be happy if it turns out there are exactly two kinds of mistakes that are not made. This may be because this is pragmatically very odd. Yet another reading, whereby the teacher will be happy if the number of mistakes that her students make is not exactly two, is predicted to be grammatically unavailable, because it would require a quantificational interpretation of the PL-QP, which is not possible. To recapitulate once again, PL-QPs can have individual-type denotations with choice functions, but never generalized quantifier-type denotations.

5. A syntax-semantics for number

What we would like to argue for now is that interpretable number features are incompatible with truly quantificational denotations. Of course, making this claim requires some understanding of how exactly number features are interpreted.

Our assumptions about syntax and semantics of number features follow the treatment thereof in [Sauerland 2003; 2008; Sauerland et al. 2005]. In Sauerland's system, interpretable number features attach to individual-denoting expressions. Their semantic import is to impose contextual definedness conditions (presuppositions) on the denotations of expressions they attach to. The plural number feature denotes an identity function without any added presuppositions, while the singular number feature makes the expression defined only if it denotes an atomic individual:

(21)   a. $[[SG]]_{<e,e>} = \lambda x_e$: x is atomic. x

      b. $[[PL]]_{<e,e>} = \lambda x_e. x$

It is assumed by Sauerland, here following [Link 1983] and many others, that individuals may be atomic and non-atomic. The non-atomicity inference that plural DPs normally trigger in upward-entailing contexts is derived as an "antipresupposition", given the principle *Maximize Presupposition!* of [Heim 1991] (see also [Percus 2006] and many others) that requires the speaker to use a maximally presuppositionally loaded form appropriate in the context.

(22)   *Maximize Presupposition!*
      Presuppose as much as you can in your contribution to the conversation.

Thus, in a context where, say, a single individual came, it would be inappropriate to use the plural feature to describe the situation, since according to Maximize Presupposition! the singular alternative should be preferred.

In our treatment of SN-QPs and PL-QPs in Russian, we share some of the assumptions of Sauerland's system. We take PL-QPs to be individual-denoting expressions with an interpretable plural feature. We are not sure whether the semantics for the plural feature should be exactly as in (21b) and rely on Maximize Presupposition!. Perhaps, we could make use of a system like the one in [Farkas, de Swart 2010], where besides a weak meaning, as in (21b), there is a strong meaning available for the plural feature (23).[7] The choice between the two meanings is regulated by the Strongest Meaning Hypothesis, for example, in the formulation given in (24):

(23) $[[PL_{strong}]]_{<e,e>} = \lambda x_e$: x is not atomic. x

(24)   *Strongest Meaning Hypothesis*
      In a sentence involving an element with a polysemous meaning (in cases of our interest: the plural feature), prefer that interpretation of that element which leads to the stronger overall interpretation for the sentence, unless this interpretation conflicts with the context of utterance.

Whatever the correct theory of the interpretation of the plural feature may be, we assume that SN-QPs are different from the PL-QPs in that they do not have an interpretable number feature

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[7] A weak meaning of the plural is needed anyway, since in downward-entailing contexts we do not observe multiplicity effects associated with the plural. The example below uses a PL-QP in the restrictor of a universal quantifier, a downward-entailing environment. Importantly, the sentence clearly entails that everyone who was seen by exactly one policeman was set free. This entailment would not be possible if the denotation of the plural feature here were strong.

(i)   *Každyj,   kogo   videli   men'še   trëx   policejskix,   byl   otpuščen   na   svobodu.*
     everyone   who   saw.**PL**   less.than   three   policemen   was   let   to   freedom
     'Everyone who was seen by less than three policemen was set free.'

at all.[8] PL-QPs have to be individual-denoting, because interpretable plural features are not compatible with generalized quantifier denotations. SN-QPs, on the other hand, may be generalized quantifiers without any interpretable number features.

Let us sum up our argument. QPs in general may have denotations of type e (individuals) or <<e,t>,t> (generalized quantifiers). Individual-type QPs are expected to have less "scope" options as compared to GQ-type QPs. Now, if it were the case that interpretable number features are compatible with individual type and GQ-type denotations alike, we would expect PL-QPs to allow for the same scope options that SN-QPs do. But they do not: the scopal behavior of PL-QPs is limited exactly like it would be predicted for individual-type denotations. Therefore, we conclude that interpretable number features are incompatible with generalized quantifiers.[9]

6. Concluding remarks

We have shown in this paper that expressions triggering variable number agreement in Russian have different scope potentials with respect to clausal negation. Whereas non-agreeing expressions (SN-QPs) may be interpreted in the immediate scope of negation, this is not an option for expressions that trigger plural agreement (PL-QPs).[10] We argued that these differences fall out in a system where PL-QPs, but not SN-QPs have interpretable number features. Interpetable number features are assumed to be incompatible with quantificational denotations, and this is why PL-QPs can be construed as choice-functional indefinites, but not as generalized quantifiers. It is an inherent property of choice-functional indefinites that they may not be interpreted in the immediate scope of negation. (SN-QPs, on the other hand, lack interpretable number features, and so the quantificational construal is available for them, which makes it possible for them to appear in the immediate scope of negation.)

The explanation that we have just offered for the scopal deficiency of PL-QPs (their inability to appear in the immediate scope of negation) seems to be independent of any morphosyntactic properties of Russian. In fact, it would be surprising if this were an exclusive property of Russian that interpretable number features are incompatible with generalized quantifier denotations. Stated this way, it looks like a potential semantic universal.

We do not really know if this incompatibility thesis holds across all languages, but we can have a research program in which we hypothesize that it does and look for cases that could falsify it (cf. [von Fintel, Matthewson 2008] on semantic universals). This might be a program for the future, but for now it may be useful to speculate if our thesis could follow from more general principles. If it does, there will be more reasons to believe in its universal status.

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[8] Note that if the semantics of the plural feature is always weak, it cannot be strengthened in the case of PL-QPs, e.g., in (1)–(3), since alternatives with the singular number feature seem to be internally contradictory. We leave the question whether this is a desirable prediction for future research.

[9] In fact, in Sauerland's system quantifiers may also have interpretable number features, but these number features are still assumed to be modifying individual-type denotations at LF. With quantifiers, these individual-type denotations are assumed to be the denotations of the traces of quantifiers, which must all undergo quantifier raising (see a discussion, especially in what concerns existential quantifiers, in [Ivlieva 2013: 89–92]).

[10] We believe that our system can be extended to account for those variable agreement quantity expressions headed by nouns like *polovina* 'half' or *bol'šinstvo* 'majority', the alternants there being PL-QPs and HN-QPs, which trigger verbal agreement with the features of the head noun. It may require some adjustments, but it looks like HN-QPs pattern with SN-QPs (which must be because they do not have interpretable number features), and PL-QPs (which have interpretable number) have the same scopal limitations as we described for the PL-QPs in alternations with SN-QPs.
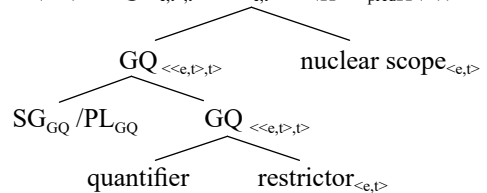
A possible source of our incompatibility thesis could be a principle of economy. Let us take it for granted, combining the ideas from [Sauerland 2003] and [Mayr 2015], that number features can modify not only individual, but also predicate denotations (semantic types e and $\langle e,t \rangle$). The denotations for predicative number features are given below:

(25)   a. $[[\text{SG}_{\text{pred}}]]_{\langle\langle e,t \rangle, \langle e,t \rangle\rangle} = \lambda P_{\langle e,t \rangle}. \lambda x_e: x$ is atomic. $P(x)$

       b. $[[\text{PL}_{\text{pred}}]]_{\langle\langle e,t \rangle, \langle e,t \rangle\rangle} = \lambda P_{\langle e,t \rangle}. *P$, where $*$ is Link's "star-operator", which closes the predicate under sum formation.

Suppose now there is principle that says the **presuppositional features should modify meanings in the most direct way possible**. Hypothetical number features that modify generalized quantifiers could constrain their restrictors or their nuclear scopes, predicates of type $\langle e,t \rangle$. In (26) we provide hypothetical denotations for GQ-modifying number features that constrain the nuclear scope. It is easy to show that combining GQs equipped with interpretable number features with their nuclear scopes would be equivalent to combining "unnumbered" GQs with "numbered" nuclear scopes (27).

(26)   Hypothetical (but non-existent) denotations for GQ-modifying number features:

       a. $[[\text{SG}_{\text{GQ}}]]_{\langle\langle\langle e,t \rangle, t \rangle, \langle\langle e,t \rangle, t \rangle\rangle} = \lambda Q_{\langle\langle e,t \rangle, t \rangle}. \lambda P_{\langle e,t \rangle}. Q[\lambda x_e: x$ is atomic. $P(x)] =$
                                                $= \lambda Q_{\langle\langle e,t \rangle, t \rangle}. \lambda P_{\langle e,t \rangle}. Q([[\text{SG}_{\text{pred}}]](P))$

       b. $[[\text{PL}_{\text{GQ}}]]_{\langle\langle\langle e,t \rangle, t \rangle, \langle\langle e,t \rangle, t \rangle\rangle} = \lambda Q_{\langle\langle e,t \rangle, t \rangle}. \lambda P_{\langle e,t \rangle}. Q(*P) = \lambda Q_{\langle\langle e,t \rangle, t \rangle}. \lambda P_{\langle e,t \rangle}. Q([[\text{PL}_{\text{pred}}]](P))$

(27)   For any generalized quantifier Q and any predicate P:

       a. $([[\text{SG}_{\text{GQ}}]](Q))(P) \Leftrightarrow Q([[\text{SG}_{\text{pred}}]](P))$

       b. $([[\text{PL}_{\text{GQ}}]](Q))(P) \Leftrightarrow Q([[\text{PL}_{\text{pred}}]](P))$

Given the premise that number features could modify $\langle e,t \rangle$-type predicates directly, the economy principle predicts that GQ-modifying number features should not exist.

This is just a rough sketch, of course, but it may show that our proposed universal about the incompatibility of interpretable number features and generalized quantifiers has some potential.

Coming back to things less hypothetical, we should say that our account already crucially relies on assumptions about possible and impossible denotations that are far from obvious. For example, while it is a matter of some debate whether choice functions are needed at all to analyze indefinite expressions (for example, in [von Fintel 1999] or [Schwarzschild 2002] it is argued that different readings of indefinites can be successfully analyzed with the help of existential quantifiers with different domain restrictions), here we make full use of them, contrasting them with generalized quantifiers in our formulation of the incompatibility thesis.

A system where indefinites always have quantificational denotations may be conceptually preferred to the one where there are two potential construals for indefinites, quantificational and choice-functional, as the former is more restrictive. What we do here is take an initially less restrictive system and add a constraint on denotation compatibility. Be it conceptually desirable or not, this is the only way that we see now to make sense of the scope patterns we described.

7. A note of caution

An anonymous reviewer suggests that one can come up with a number of examples where a PL-QP does seem to take scope immediately under negation, thus questioning the validity of the core generalization that this study is based on. These potential counterexamples deserve some discussion. Here is an illustrative dialogue that we thank the reviewer for:

(28) A: *Devjanosto   procentov   moskvičej   otkliknulis'   na   prizyv.*
         90   percent   Muscovites   responded   on   call
      '90 % of Muscovites answered the call.'

   B: *Èto   nepravda!   Devjanosto   procentov   moskvičej   na   prizyv   ne*
       this   not.truth   90   percent   Muscovites   on   call   not
      otkliknulis'.
      responded
      'No, it's not true that 90 % Muscovites answered the call.'

It looks like in this exchange B is refuting the claim made by A ('90 % Muscovites answered the call'), using the same plural verbal form as A, that is, using a PL-QP, not a SN-QP. By doing this, B does not claim that there are 90 % Muscovites who didn't answer the call (*90 % > not*), his response is compatible, for example, with a situation where 80 % Muscovites did answer the call. This seems to be the reading where negation immediately scopes over the PL-QP (*not > 90 %*), which is precisely what we argue to be impossible.

Our take on such examples is that they illustrate not a true scopal sequence, but rather a homogeneity violation.

A predicate P is said to be homogenous if it holds that P(A) is either true of all the members of the group individual A or false of any member of that individual. For instance, it is the homogeneity of the predicate 'come' that makes the inference in (29) possible:

(29) *John and Bill didn't come. → Neither John nor Bill came.*

However, there are known cases of homogeneity violations. One case when homogeneity is violated occurs when a speaker explicitly denies a claim about a group, of which a homogenous property is predicated. This is what happens in the following dialogue:

(30) A: *Poxože,   čto   v   vyborax   snova   budut   učastvovat'   Bajden   i   Tramp.*
         looks.like   that   in   election   again   will.**PL**   take.part   Biden   and   Trump
      'It looks like Biden and trump will run in the election again.'

   B: *Net,   v   vyborax   ne   budut   učastvovat'   Bajden   i   Tramp.*
       no,   in   election   not   will.**PL**   take.part   Biden   and   Trump
      To   est'   Tramp-to,   konečno,   budet,   no   vmesto   Bajdena
       that   is   Trump   of.course   will,   but   instead   of.Biden
      podberut   kogo-nibud'   pomolože.
      they.will.find   someone   younger
      'No, it will not be Biden and Trump who run in the election. Well, Trump will run, of course, but they are going to find someone younger to replace Biden.'

A makes a claim about a group consisting of Biden (b) and Trump (t), saying that a homogenous predicate R 'will run in the election' holds of this group, thus referring to the cell W_1 in the partition of worlds in (31). B refutes this claim by postulating a logical complement of the proposition W_1: the set of possible worlds $W_1 \cup W_2 \cup W_3$, further leaning towards the proposition W_2 (if B respected R's homogeneity, his negative response would be understood as referring to W_4: 'neither Biden nor Trump will take part in the election').

(31) *A partition of worlds:*

	R(b)	ˉR(b)
R(t)	W$_1$: R(b) & R(t)	W$_2$: ˉR(b) & R(t)
ˉR(t)	W$_3$: R(b) & ˉR(t)	W$_4$: ˉR(b) & ˉR(t)

What we learn from the dialogue in (30) is that homogeneity can be violated in denials. Importantly, such homogeneity violations do not amount to an existential quantifier taking scope below negation, which makes it possible to cast under doubt the status of (28) as a counterexample to the generalization that PL-QPs cannot take scope immediately under negation. Rather, we can view it is as an example of homogeneity violation. *Devjanosto procentov moskvičej* '90 % Muscovites' denotes a group individual (which is what we expect for a PL-QP), in both A's and B's utterances. B's response denies that the predicate *otkliknulis' na prizyv* 'answered the call' holds of this group individual as whole, creating an illusion of an existential quantifier in the scope of negation, without it actually being the case.

The existence of homogeneity violations certainly makes the overall picture that we are arguing for fuzzier, but it has to be said that outside of specific contexts, homogeneity violations are not expected. In a future experimental study of the interpetational effects of variable number agreement, one should control for homogeneity violations among other things.

ABBREVIATIONS

3 — 3rd person   N — neuter   PL — plural   PST — past   SG — singular

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