An economy theory of PRO

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This paper provides a novel account of the nullness and the distribution of PRO. First, it provides empirical evidence to show that PRO is a highly deficient pronoun. Following Cardinaletti and Starke (1999)'s theory of pronominal deficiency, PRO is treated as a bare NP, nothing more than a reference variable that does not project ϕ-features. This rules it out from occurring in the subject position of most finite clauses. Second, assuming that clausal complements come in at least three different sizes–finite or nonfinite CP, TP and vP–five novel pieces of evidence establish that as a clause becomes more deficient in syntactic and semantic features, its subject must too. This necessitates PRO's being read as a bound variable. The distribution and nullness of PRO is derived under Cardinaletti and Starke's framework of syntactic economy in which the smallest possible pronoun, PRO, is preferred as the subject of control infinitives because it is the most economical.

Keywords: pronouns, economy, control, deficiency, nullness

1 Introduction

On one hand, that infinitives are *deficient* in some manner, whether syntactic or semantic, is an ubiquitous claim in the literature. On the other, the subject of control infinitives, PRO, has also been noted to be deficient in syntactic properties: nothing more than a "reference variable" according to Sigurðsson (2008) and a minimal pronoun, lacking ϕ-features entirely, according to Chomsky and Lasnik (1995), Kratzer (2009) and Landau (2015). This might lead one to suspect whether the deficiency of infinitives has something to do with the nature of PRO. My goal is to motivate such a relationship: I will argue that the reason PRO exists–in other words, why the subject of control infinitives is null–arises from the syntactic and semantic deficiency of its clause.

Let's start with some of the basics. The subject of an infinitive cannot (usually) be an overt NP, as in (1a) below, so PRO has often been taken to be in complementary distribution with overt pronouns. But certain embedding predicates like *believe* allow for an accusative-case marked infinitival subject as in (1b). Alternatively, the prepositional complementizer *for* can be used to obviate this restriction in (1c).

(1) a. Caitlin decided (*Mary/*herself) to leave. *Control*
b. Caitlin believed (Mary/herself) to be smart. *Exceptional Case Marking (ECM)*
c. Caitin is eager for Mary to eat pizza. *Complementizer for*

The ECM/control distinction received attention once more with the advent of the Minimalist program. The most well-known account of the distribution of PRO was first presented by Chomsky and Lasnik (1995), and developed further by Martin (1996, 2001) and Bošković (1996). These authors posited the existence of *Null Case* for the subject position of control infinitives. On the

other hand, no such Case is available in the subject position of ECM infinitives. PRO, due to its nature as a minimal pronoun, is claimed to be the sole NP that can receive Null Case. The Case Filter could then be taken to regulate the distribution of all nominal phrases, even PRO.

As Bobaljik and Wurmbrand (2008) note, however, the Null Case view faces multiple severe problems. I will note three empirical issues here. First, there are multiple languages like Icelandic (Sigurðsson (1991)), Italian, Russian and Latin (Cecchetto and Oniga (2004)) in which PRO itself seems to receive detectable morphological case, and not Null Case. In the Icelandic example (2), the quirky accusative case from the embedded verb resurfaces on the quantifier:

(2) María$_i$ vonast til [að PRO$_i$ vanta ekki eina$_i$ í tíma].
Mary.NOM.SG.F hopes for to lack not alone.ACC.SG..F in class
'Mary hopes not to be missing alone from class.'

The second problem is that infinitival tense is used to predict the presence of Null Case in an infinitive. According to Stowell (1982), control infinitives typically have a future-oriented temporal interpretation while ECM infinitives typically have a simultaneous one. Future-oriented infinitives are claimed to possess Null Case while simultaneous ones do not. But Bobaljik and Wurmbrand note that infinitival tense cannot be used to determine the presence of Null Case. For instance, there are control predicates like *claim* whose complement has a simultaneous interpretation.[1] The presence of Null Case thus may not be independently predictable, and not an improvement over earlier accounts of the distribution of PRO.

Finally, it may not even be true that PRO is in complementary distribution with overt pronouns. For example, McFadden and Sundaresan (2014) present evidence from languages such as Tamil, Sinhala, Modern Irish and Middle English which have clauses that are clearly nonfinite– that lack tense and agreement–yet allow subjects to be licensed, as in (58b) below.

(3) Ghoillfeadh se orm [tu me a ionsai].
would.bother it on.me you.ACC me INF attack
'It would bother me for you to attack me.' Irish

Given this, what is there left to explain? In my view, explaining the distribution of PRO remains equally pressing, for two reasons. First, overt infinitival subjects are quite marked; the vast majority of control infinitives crosslinguistically have a null subject. This correlation still has to be accounted for. Second, it turns out that virtually all of the examples in the literature which involve overt subjects in control infinitives involve either case- or focus-marking on the infinitival subject. This pattern also has to be explained.

I will argue that PRO is the most economical subject for a control infinitive. Following Kratzer (2009)'s syntax and semantics of control infinitives, PRO is bound locally by an operator in the left periphery and interpreted as a bound variable. Its subject must therefore be a pronoun of some kind. But one additional step is needed to derive its nullness, for which I adopt Cardinaletti and Starke (1999)'s (C&S) framework of deficient pronouns.

C&S show that if a more deficient form of pronoun is possible in a sentence, it must be picked out of all other larger alternatives. This is captured via an economy constraint to minimize syntactic structure. I first present evidence to show that PRO is a deficient pronoun. I then claim that PRO is syntactically the smallest possible pronoun: it is a bare NP that is nothing more than a

[1] See Wurmbrand (2014) for further discussion.

variable, and such a pronoun is sufficient to get the right syntax and semantics for control. PRO is null *because* it is so deficient in features. And the possibility of the very economical PRO blocks clitics and other deficient pronouns from appearing as the subject of a control infinitive.

The plan is as follows. In section 2, I introduce the reader to Cardinaletti and Starke (1999)'s framework on the syntactic structure of deficient pronouns, and argue in the next section that PRO is in fact a deficient pronoun–a mere NP. I conclude that we should not take it to be a coincidence that both control infinitives and their subject are deficient, accounting for this relationship in terms of an economy constraint. Section 4 presents finer-grained evidence in favor of the relationship between subject size and clause size, based on Wurmbrand and Lohninger (2019). Section 5 presents the analysis in further detail, addressing certain puzzles. Section 6 concludes.

2 Deficient pronouns

My goal in this section is to introduce the reader to Cardinaletti and Starke (1999)'s seminal work on the typology of strong and deficient pronouns.[2] 2.1 introduces the empirical background for the distinction between strong and weak pronouns, while 2.2 provides an account.

2.1 Strong vs. deficient pronouns

As C&S note, words fall into classes. What appears to be one pronoun can have very different properties. As the summary in Table 1 below demonstrates, the class of pronouns–represented in Table 1 with Italian *loro*, *esse* and French *elles*–that can only have human referents can also be coordinated. There is no necessary connection between the two properties, but it persists even so.

		Only human referents	Occurs in coordination
Class 1	*loro*, *elles*$_1$	+	+
Class 2	*esse*, *elles*$_2$	−	−

Table 1: A summary of the properties of two classes of pronouns

The first class of pronouns are called *strong* pronouns, whereas the second class of pronouns are called *deficient* pronouns. To see some examples, in Italian, the third person plural feminine nominative pronoun splits into two distinct classes, each with its own different syntactic and semantic properties. The pronoun *esse* in (4a) can be cannot be coordinated, and it need not have human referents. *Loro* in (4b) can be coordinated, but it must have human referents.

(4) a. **Esse** (*e quelle accanto) sono troppo alte.
3PL.FEM.NOM (and those besides) are too tall/high

b. **Loro** (e quelle accanto) sono troppo alte.
3PL.FEM.NOM (and those besides) are too tall/high Italian

[2] Although there are other accounts which separate pronouns into different classes, here I will use C&S as the foundation of this paper. See Déchaine and Wiltschko (2002) and Holmberg (2005) among others. Each of these accounts have some differences but are largely similar: most importantly, for Déchaine & Wiltschko, NP pronouns cannot have bound variable readings while there is no such restriction for C&S. ϕP, however, appears to be mostly the same in all accounts: it must be bound by some antecedent. In all of these accounts D is the locus of referentiality, though the technical details differ slightly. The reader is referred to these works for further details.

The same pattern is seen in French below, in which the two classes of pronouns are phonetically identical. The non-human reading of *elles* vanishes in (5b), because it is coordinated.

(5) a. Elles sont trop grandes.
b. Elles et celles d'à côté sont trop grandes. French

Table 2 provides a summary of the relevant properties to be discussed shortly:

Pronouns	D-antecedent?	Expletive?	Impersonal?	Non-human?	De se reading?
Strong	✗	✗	✗	✗	✗
Deficient	✓	✓	✓	✓	✓

Table 2: A summary of the properties of strong and deficient pronouns

I will now provide an in-depth comparison of the properties of strong vs. deficient pronouns.

Must have a D-antecedent?: According to C&S, strong pronouns are fully independent, in that they able to bear their own referential index. In other words, they can refer to entities that are not contextually salient in the discourse, nor do they need to have an antecedent in the sentence. By contrast, deficient pronouns need such an antecedent.

I present examples from French involving ostension from C&S below. A strong pronoun can easily accompany ostension, as in (6a). Although in most cases deficient pronouns cannot accompany ostension, as in (6b), this is simply because it is not sufficiently prominent in the discourse. In (6c) and (6d), *this house* and *this book*, both non-human, are sufficiently prominent in the discourse. This allows for the weak pronoun to accompany ostension:

(6) a. J'ai vu Marie puis je ai vu ☞elle.
I have seen Mary then I her have seen
b. * J'ai vu Marie puis je ☞l' ai vu.
I have seen Mary then I her have seen
c. Mets-toi içi et regardes cette maison Tu ☞la vois bien maintenant?
come here and look-at this house. You it see well now
d. Mais, tu ne vois donc pas ce livre? Bien sûr que je ☞le vois.
but, you don't see therefore not this book of course that I it see French

Can be expletive?: Expletive constructions require personal pronouns to be deficient. Strong pronouns can never be present in such positions:

(7) a. Il pleut.
he rains
b. * Lui (il) pleut. he (he) rains
a. Il est arrivé un grand malheur.
he is arrived a big disaster
b. * Lui (il) est arrivé un grand malheur
he (he) is arrived a big disaster French

Can be impersonal?: Strong pronouns are never interpretable in impersonal constructions. The deficient pronoun *on* in French can occur in an impersonal, whereas in (9a)-(9c), only the deficient form of the third person plural pronoun *ils* may occur. Its strong counterpart *eux* cannot. In other words, (9b)-(9c) are unacceptable if read as impersonals, but are fully acceptable with a referential reading:

(8) On t' a vendu un livre pas cher.
they$_{\text{non-ref}}$/we$_{\text{ref}}$ you have sold a book not expensive

(9) a. Ils m' ont vendu un livre pas cher.
they have sold a book not expensive

b. # Eux ils m' ont vendu un livre pas cher.
they they have sold a book not expensive

c. # Eux m' ont vendu un livre pas cher.
they me have sold a book not expensive French

Obligatory de se reading?: This is a test that is not in C&S, but rather a more recent discovery by Patel-Grosz (2019), based on evidence from Kutchi Gujarati and Austrian Bavarian. The evidence that I would like to consider involves a little pro, which as we will see later in this section is a deficient pronoun. Patel-Grosz notes that in Kutchi Gujarati, pro must be read de se, even in a finite clause. Although both sentences in (10) are grammatical, the one with a null pronoun is false because it must be read de se:

(10) Context: A group of drunk election candidates watching campaign speeches on television do not recognize themselves in the broadcast. Valji and Lalji, the two confident ones, think "I'll win," but do not recognize themselves in the broadcast. Khimji and Raj, both depressive, think "I'll lose" but are impressed by the speeches that happen to be their own and are sure "that candidate" will win.
People who believe that they themselves will win: everyone
People who believe de se *that they will win*: only Valji and Lalji

a. Harek manas maan-e ke i jeet-se.
every man believe-3SG.PRES that he win-FUT.3SG
'Every man believes that he will win.' TRUE

b. Harek manas maan-e ke (pro) jeet-se.
every man believe-3SG.PRES that pro win-FUT.3SG
'Every man believes that he will win.' FALSE Kutchi Gujarati

With the empirical background mostly established, let us see how to account for these facts.

2.2 The syntactic structure of deficiency

The most relevant kind of example of a deficient pronoun for the purposes of this paper is little pro, which we just saw. As C&S note, it has the semantics of a deficient pronoun. It can be an expletive (11a), impersonal (11b), non-human (11c), and it cannot denote a non-prominent discourse referent with ostension (11d).

(11) a. pro piove molto qui.
it-rains a-lot here

b. pro mi hanno venduto un libro danneggiato.
me they-have sold a book rotten

c. pro è molto costoso.
it-is very expensive

d. * ☞pro è veramente bello.
it-is very nice

Perhaps the most important fact to note in this paper is that deficient pronouns must be picked over strong pronouns when there is a choice between the two. This goes back to at least Chomsky (1981), who dubbed it the *Avoid Pronoun Principle*. It was much broader in use, as Chomsky originally used to impose a choice of PRO over overt NPs among other things.[3]Indeed, the weak pro must be picked over the strong *lui* when pro is possible, as (12a)-(12b) demonstrate:

(12) a. Gianni ha telefonato quando **pro** è arrivato a casa.
John has called when he is arrived at home

b. * Gianni ha telefonato quando lui è arrivato a casa.
John has called when he is arrived at home

Rather than Chomsky's Avoid Pronoun Principle, such facts are captured by C&S in terms of an economy constraint to minimize syntactic structure in a derivation, when possible.[4] In other words, whenever a smaller syntactic structure is possible, it must be chosen, and only when the smaller structure is ruled out for independent reasons is the larger, stronger structure possible.

(13) *Economy of Representations*
Minimize Structure

Before concluding, I would like to point out that deficient pronouns split into two types: weak pronouns and clitics. The main reason for this split is that clitics, when possible, are picked over weak pronouns, as C&S's data from Olang-Tirolese demonstrate. The possibility of the clitic disqualifies the weak pronoun (14a)-(14b), but when the clitic is not possible for independent reasons, the weak pronoun is then possible in (14c)-(14d).

(14) a. ...daβ z=toire isch
...that it=expensive is

[3]One piece of data that I will not discuss in further detail in this paper are gerunds. In gerunds, when both *his* and PRO are attested, but *his* cannot appear in gerunds where PRO is possible:

(i) John$_i$ would much prefer PRO$_{i/*j}$his$_{*i/j}$ going to the movie.

It appears that the nominal core of gerunds interacts with the economy constraint I will propose in this paper in some way that we do not yet fully understand.

[4]Both *egli*, the weak counterpart of *he* in Italian, and pro can be used in the sentences below.

(i) a. Gianni$_i$ partirá quando pro$_i$, avrá finito il lavoro.
John will.leave when pro will.have finished the work

b. Gianni$_i$ partirá quando egli$_i$, avrá finito il lavoro.
John will.leave when he will.have finished the work

This means that an economy constraint is preferable over Chomsky's *Avoid Pronoun Principle*, because as C&S note, Chomsky's principle requires that the null pronoun be chosen over the realized one where possible. C&S provide additional evidence against this (p. 198-199) which the reader can verify.

b. * ...daβ es toire is
...that it expensive is

c. * S=isch toire.
it=is expensive

d. Es isch toire.
it is expensive

C&S capture this contrast with the following three-way distinction in syntactic structure between strong pronouns, weak pronouns and clitics. Weak pronouns are "peeled" weak pronouns, while clitics are "peeled" weak pronouns, in the words of C&S.

(15) a. Strong pronoun: DP > FocusP > ϕP > NP

b. Weak pronoun: FocusP > ϕP > NP

c. Clitic: ϕP > NP

Strong pronouns project the full array of nominal projections, with D at the top. D is the locus of the referential index of the nominal. A nominal with a D layer is capable of bearing a referential index on its own and need not have an antecedent, whether it is in the sentence, or merely a contextually salient one. Deficient pronouns lack a D layer, and therefore need to have an antecedent.

Both weak pronouns and clitics bear ϕ-features, and this similarity is captured via the presence of ϕP in both. But the contrast between weak pronouns and clitics is captured via an additional layer in between DP and ϕP, which I call FocusP. It is the locus of prosody-related features of the nominal, such as focus and polarity (assertion or negation). C&S show that clitics are not able to bear prosody-related features, but I will not get further into this issue here.[5] We will now determine how PRO fits into the picture involving strong and weak pronouns plus clitics.

3 The size of PRO

We now have the necessary background to determine the syntactic structure of PRO. Following Landau (2013) among others, I distinguish between two types of PRO: obligatorily controlled (OC) and non-obligatorily controlled (NOC) PRO, and henceforth, when I use "PRO" I mean to refer only to OC PRO. In 3.1, I apply Cardinaletti and Starke (1999)'s tests to obligatorily controlled PRO, and conclude that PRO is also a deficient pronoun, but one that is even more deficient than a clitic. 3.2 provides a discussion of NOC PRO; I claim it is larger than OC PRO.

3.1 PRO as a deficient pronoun

Though many authors such as Chomsky and Lasnik (1995), Sigurðsson (2008), Kratzer (2009) and Landau (2015) have claimed that PRO is a minimal pronoun, empirical evidence to distinguish PRO from other pronouns in terms of its syntactic properties has not yet been provided in the literature. My goal here is to do so, before presenting further evidence for a relationship between clause and subject size in the next section. I will now go through the tests covered in section 2 one by one, presenting a summary below:

[5] I refer the reader to Cardinaletti and Starke (1999) for further details on the possibility of focus-marking on weak pronouns and the contrast with clitics.

Pronouns	D-antecedent?	Expletive?	Impersonal?	Non-human?	De se reading?
Strong	✗	✗	✗	✗	✗
Deficient	✓	✓	✓	✓	✓
PRO	✓	✗	✓	✓	✓

Table 3: A summary of the properties of PRO compared with strong and deficient pronouns

PRO must have an antecedent: It is well known that obligatorily controlled PRO must have a local antecedent.[6] The controller in (16) must be the object *Mary* and not the subject *John*:

(16) John$_i$ persuaded Mary$_j$ [PRO$_{*i/j}$ to take out the trash].

PRO is obligatorily read de se, when it can: It has been well-known since at least Castañeda (1966) that PRO is obligatorily interpreted *de se*. Evidence for this is given in (17), in which we see a contrast between overt pronouns, which allows a de re construal, while PRO does not. The context provided brings out a de re interpretation, meaning that Leo does not bear a de se self-acquaintance relation to the man he believes to be on fire, in this case himself. The overt pronoun *he* in (17a) can be read de re, while PRO in (29b) cannot be:

(17) Leo is very drunk and on fire. He says the man in the mirror is on fire, not realizing that it is in fact himself.

a. Leo claimed he was on fire.

b. # Leo claimed to be on fire.

Non-human readings: As Landau (2013)'s examples (18a)-(18c) demonstrate, OC PRO need not have a human antecedent.

(18) a. This key$_i$ will serve/do [PRO$_i$ to open the door].

b. The accident$_i$ is responsible [for PRO$_i$ causing the ship to sink].

c. The transmission problem forced the car$_i$ [PRO$_i$ to stop].

Impersonal readings: Landau (2013) notes that English allows a few impersonal passives:[7]

(19) a. It was decided to move forward.

b. It was hoped to provide an accessible and more effective service.

c. It was planned to focus on certain sectors such as tourism.

Landau shows that such examples involve OC rather than NOC PRO. The examples below do not allow for the local agent to be skipped by PRO:

(20) a. * It was decided by John$_i$ [PRO$_i$ to teach him$_i$ Spanish].

b. * Mary$_i$ said that it was decided by John [PRO$_i$ to behave herself].

[6] Here I am putting aside the well known counterexample to this pattern, *promise*. The reader can find helpful introductions of control as a linguistic phenomenon in Landau (2013) and Potsdam and Haddad (2017).

[7] Landau (2013) states that German and Dutch much more productively derive impersonal passives from subject control verbs (see p. 181 for examples).

Expletive control: Given that PRO must have a θ-role, we would expect expletives to be unable to serve as an antecedent for PRO, as Brody (1984) suggests.[8] This is borne out, no PRO is allowed in (21) when *there* is the controller. Another *there* is needed, in this example from Postal (1974):

(21) There_i can't be peace [without there/*PRO_i being war first].

Although this means that PRO differs from deficient pronouns in this regard, I do not see this as problematic, given that PRO needs a θ-role. Ultimately, what we see from these tests is that apart from the lack of expletive control, PRO does have the properties of a deficient pronoun. This provides empirical evidence for the common conclusion that PRO is a minimal and deficient pronoun, and is the first step for us come up with a recipe of why PRO exists to begin with.

The only property PRO possesses is that it is a "reference variable," as Sigurðsson (2008) suggests, but it does not have any ϕ-features. Thus, I would like to propose that PRO is even smaller than a clitic, in that it does not project ϕP, which means that it does not have any ϕ-features. This is perfectly in line with Kratzer and Landau's proposals in addition to C&S's account.

(22) a. Strong pronoun: DP > FocusP > ϕP > NP
b. Weak pronoun: FocusP > ϕP > NP
c. Clitic: ϕP > NP
d. PRO: NP

I assume that the nominal projections are ordered with respect to each other, so that pronouns which, for instance, skip a ϕP but are headed by D do not exist.

There are two reasons to associate PRO with the lack of ϕP. As is well-known, PRO does not occur in the vast majority of finite clauses.[9] One way to derive this is as follows. The subject of a finite clause must be as large as possible to satisfy finite T's need for agreement; this would rule out PRO from occurring in the subject position of most finite clauses. In addition, with the exception of inflected infinitives in certain languages, the infinitival verb surfaces without agreement in languages like English. This indicates that infinitival T does not usually participate in ϕ-agreement. These two reasons together highlight the complementary relationship between PRO and finite T. More will need to be said in section 5 before I can extend C&S's theory of economy to PRO, although that will end up being the most important piece of the puzzle.

3.2 Why is PRO null?

We can now determine why PRO is often, if not always, null. But before doing so, one has to consider here the possibility of languages which might have an overt PRO. Many linguists have claimed that it is attested in several languages. For example, overt anaphors may occur in the

[8] Landau (2013) points out that the picture here is mixed. Surprisingly, Chomsky (1981) notes that weather *it* can participate in control:

(i) Around here, it_i always snows before [PRO_i raining].

[9] This is with the exception of the phenomenon of finite control noted by Landau (2004, 2013) in languages like Hebrew, limited to embedded clauses in the subjunctive mood which I present an account of in section 5.

subject position of a control complement in Chinese, Korean and Japanese (Yang (1985), Borer (1989), Madigan (2008), Lee (2009)).[10] An Chinese example is seen in (23):

(23) Zhangsan$_i$ bi Lisi$_j$ [PRO$_{j/*i}$/ziji$_{j/*i}$ xie zuoye].
John force Bill PRO/self write homework
'John$_i$ forced Bill$_j$ PRO$_{j/*i}$ to do the homework.' Chinese, Madigan (2008)

It is controversial whether such cases involve overt PRO–they may in fact be emphatic doubles as Landau (2013) suggests. Even so, it would not be wise to rule out the possibility of an overt PRO entirely, and I will not do so here. Indeed, Szabolcsi (2009) has convincingly argued that languages like Hungarian and Italian allow overt nominative subjects in unambiguously nonfinite clauses, however, as long as they are modified by a scope-bearing element like *only* or *too*. They must, therefore, be focused: this piece of information will turn out to be crucial to my analysis in section 5. Regardless, examples from Hungarian (24a)-(24b) and (25a)-(25b) are given below:

(24) a. Utálok [**én** is magas lenni].
hate.1SG I.NOM too tall be.INF
'I hate it to be the case that I too am tall.'

b. Elkezdett [**kevesebb színésznö** kapni jó kritikákat].
PRT-began.3SG fewer actress.NOM get.INF good reviews.ACC
'It began to be the case that fewer actresses were getting good reviews.' Hungarian

(25) a. Ogni ragazzo vuole [lavorare sodo **anche lui**].
every boy wants work.INF hard also he.NOM
'Every boy wants it to be the case that he too works hard.'

b. Non sembro [cantare **solo io** su questo nastro].
not seem.1SG sing.INF only I.NOM on this tape
'It doesn't seem to be the case that only I am singing on this tape.' Italian

She provides evidence that the subject is located in the embedded clause and has not moved up to the matrix clause. For instance, the only interpretation of (25b) is the one in which *only* scopes below negation. This indicates that it has not raised to become the subject of the matrix clause, in which case the opposite would be predicted. Szabolcsi provides further evidence from intonation, binding and word-order, which I will not go into here–she rules out the possibility that it is an emphatic double.

It appears that there is simply an overwhelming correlation for the nullness of PRO, but it is not necessarily the case. This can be explained via the tools given to us by C&S. Pronouns classified as strong under their account can never be null. As we saw in 2.2, little pro, which is null, is a deficient pronoun. It can also be made overt, as (26a)-(26b) demonstrate. Both *egli*, the weak counterpart of *he* in Italian, and pro can be used in the sentences below, indicating that they have the same syntactic structure as they are economically equal.

(26) a. Gianni$_i$ partirá quando pro$_i$, avrá finito il lavoro.
John will.leave when pro will.have finished the work

b. Gianni$_i$ partirá quando egli$_i$, avrá finito il lavoro.
John will.leave when he will.have finished the work

[10] See also McFadden and Sundaresan (2011) for the simplex reflexive in Tamil behaving as an overt PRO, and Sulemana (2018, 2021) for an overt, third person pronoun behaving as an overt PRO in Buli.

To summarize, it appears that the empirical picture is thus: strong pronouns can never be null; weak pronouns can but need not be, depending on the language; finally, a highly deficient pronoun like PRO must often, if not always, be null.

I would therefore like to claim that there is an inverse correlation between the strength of a pronoun and its phonetic overtness: the weaker a pronoun is, the more likely it is to be null. PRO, being even more truncated than pro and lacking even ϕ-features, is exceedingly unlikely to be pronounced. So it is not surprising that PRO is null in the vast majority of languages, and this correlation is something that my account of PRO being a bare NP–a mere reference variable–is able to capture. Given that there is a mere correlation, this leaves room for language variation.

As we will see in the following section, crosslinguistically, infinitives of different sizes allow different-sized subjects. I will claim that in Tamil, for instance, that PRO is attested is only in the smallest vP-infinitives, and not in the larger TP infinitives. But what is ultimately the case is that all languages obey an *implicational hierarchy* of subject size with regards to clause size. For instance, a vP infinitive in any language will never allow a larger subject than what is allowed in a TP infinitive. And this is the case in Tamil.

Although I have proposed an explanation of why PRO is null, I have not yet provided an explanation for why PRO can only occur in the environment that it occurs in: the subject position of control infinitives and, in some languages, finite clauses in the subjunctive mood. This will be answered in section 5. In addition, although I have claimed that highly deficient subjects can only occur in deficient clauses, I have provided few details on this relationship. I will also determine whether there is a finer relationship between the two. That is, if infinitives do come in different sizes as Wurmbrand and Lohninger (2019) alleges, we would expect larger subjects to be possible in larger infinitives, and smaller subjects to be possible in smaller infinitives. Such patterns appear to be attested, as we will now see.

3.3 The size of non-obligatorily controlled PRO

Before concluding this section, I would like to provide a discussion of NOC PRO. Its properties have not been fully investigated thus far in the literature, but it appears to be more like a strong pronoun than a weak pronoun.[11]

Pronouns	D-antecedent?	Expletive?	Impersonal?	Non-human?	De se reading?
Strong	✗	✗	✗	✗	✗
Deficient	✓	✓	✓	✓	✓
OC PRO	✓	✗	✓	✓	✓
NOC PRO	✗	✗	?	✗	✗

Table 4: A summary of the properties of OC PRO, NOC PRO, strong and deficient pronouns

[11] I have put a question mark on whether NOC PRO can have impersonal readings. Many linguists have taken for granted Bresnan (1982)'s conclusion that subject control verbs cannot be passivized, which she dubbed *Visser's Generalization*, and assumed that PRO in impersonal passives is in fact NOC PRO. However, Landau (2013) gives reasons to believe that at least some of the examples in this case in fact involve OC PRO; the same reasons we discussed in (20a)-(20b) above. It is likely it cannot have impersonal readings, like other strong pronouns, but given the lack of certainty I leave it open.

It is somewhat controversial whether NOC PRO requires a local antecedent or not; by definition one could say it does not. But Lebeaux (1984), Epstein (1984) and Bhatt and Izvorski (1998) have attempted to find an antecedent for all occurrences of PRO, to reduce all instances of so-called NOC PRO to OC PRO. While these accounts differ in the technical details, all of these accounts share the same general idea. The controller of PRO_{arb} might in fact be a covert, implicit argument (ImpA in (27) below), like the argument of *fun* in (27).[12]

(27) PRO_{arb} to eat apples is fun (~~for~~ ImpA).

At least for empirical purposes, I will tentatively conclude that it does not need an antecedent, taking up this issue again in 5.2.

In addition to not needing a local antecedent, it only allows [+human] interpretations, as Chomsky (1981) shows. This precludes it from being an expletive. Note that in (28a), the only possible interpretation involves contextually salient people possibly rolling down a certain hill. In addition, (28b) does not allow PRO, because it is a NOC context and it is not possible for people to snow.

(28) a. It is possible [PRO_{arb} to roll down the hill].
cf. It is possible [for the rocks to roll down the hill].

b. * [PRO to snow all day] would be a nuisance.
cf. For it to snow all day would be a nuisance.

And it need not be read de re, in Landau (2013)'s following context-sentence pair. Consider a context in which John's computer was hacked and secret files taken. John does not know it was his computer that was hacked. During an urgent meeting to discuss what happened, John says that whoever was stupid enough to get their computer hacked should be punished severely. Landau notes that (29a) is false but (29b) may be true:

(29) a. $John_i$ insists on [PRO_i being punished]. only de se - False

b. $John_i$ insists that [PRO_i being punished] will prevent future hacks. de re - True

This further indicates that NOC PRO is a separate animal that must be observed on its own terms, perhaps in future work.

4 The fine-grained relationship between clause and subject size

We've thus far seen evidence that PRO is a deficient pronoun. But *why* is it the case that PRO appears only with a subset of infinitives? The distribution of PRO could have been otherwise, and it is in fact otherwise in languages like Tamil, at least to some degree. If infinitives truly are deficient in syntactic and semantic properties, then I do not think it is coincidental that deficient clauses also require a deficient subject. This would be exceedingly unlikely.

[12] But Kawasaki (1993)'s example in (i) shows the difficulty in identifying an antecedent for all occurrences of PRO. In (i), the "implicit" argument seems to have been made overt, and it is contextually highly unlikely for babies to be smoking.

(i) It is dangerous for babies [PRO_{arb} to smoke around them].

In this section, I provide evidence that there is a finer-grained relationship between clause and subject size. Following Wurmbrand and Lohninger (2019) (W&L), I assume that complements can come in three sizes: vP, TP and a truncated CP, which I call nonfinite CP, following Satık (2022). W&L provide empirical data that control complements can in fact have CP and TP layers. They propose that there are three kinds of control complements: propositional, which are CPs; situational, which are TPs; and events, which are vPs.

For instance, CP-complements involve those which can be assigned a truth value, while TP-complements

(30) a. Caitlin claimed to have eaten salad, which is true.
b. # Caitlin decided to eat salad tomorrow, which is true.
c. Caitlin decided to fly tomorrow.
d. * Caitlin claimed to be happy tomorrow.

Though the distinction between TP- and vP-complements will be discussed further in 4.3, one preliminary piece of evidence to distinguish between

(31) a. Yesterday, Caitlin decided to eat salad tomorrow.
b. * Yesterday, Caitlin tried to eat salad tomorrow.

In 4.1, I show that in two languages, Greek and Tamil, larger subjects than expected may be allowed in deficient clauses. 4.2 provides a novel argument on the relationship between clause and subject size in Serbian. The evidence is based on clause-internal topicalization to diagnose the size of the clausal complement, following Satık (2022). In 4.3, based on evidence from Icelandic and partial control languages like English, I claim that PRO is nonexistent in vP-infinitives, which is even more economical than a minimal pronoun.

My findings are summarized in Table 5:

Language	Finite CP	Nonfinite CP	TP	vP
English	Overt NP	PC PRO	PC PRO	EC PRO
Greek	Overt NP	Invalid	Overt NP	EC PRO
Tamil	Overt NP	Overt NP	Overt NP	EC PRO
Serbian	Overt NP	Invalid	PC PRO	EC PRO
Icelandic	Overt NP	PC PRO	PC PRO	EC PRO

Table 5: A summary of the various possible subject sizes in different complement sizes in English plus the languages discussed in this section. "Invalid" means that the language does not have a nonfinite CP complement. PC stands for *partial control*; EC stands for *exhaustive control*.

4.1 Languages which allow overt subjects in TP-complement clauses

Let us start with Greek, which does not have infinitives, but still has clauses of varying sizes. Wurmbrand and Lohninger (2019) notes that vP-complement in Greek involve obligatory control, as in (32a), whereas the TP-complement in (32b) allows free reference, as does the CP-complement in (32c):

(32) a. Ta pedhja arxisan na trexun/*trexi.
the children began.3PL NA run.3PL/run.3SG
'The children began to run.'

b. Ipa ston Kosta na figi o yios tou.
told.1SG to Kosta NA leave.3SG the son his
'I asked Kosta for his son to leave.'

c. I Maria ipe oti egrapsan ena piima.
the Mary said.3SG that wrote.3PL one poem
'Mary said that they wrote a poem.'

Here, I take obligatory control in Greek vP-complements to involve exhaustive control PRO, while the others (CP and TP) can involve a larger subjects like little pro (a FocusP) or full-sized nominal phrases like *his son*, as in (32b). This is different from English: it is necessary for the complementizer to license the infinitival subject by assigning it with accusative case, whereas in Greek there is no complementizer and the subject is in the nominative form.

Tamil has infinitives unlike Greek. According to McFadden and Sundaresan (2011), adjunct infinitives in Tamil freely allow overt NP subjects. I take the infinitive in (33) to be at least a TP, given that it has a future-irrealis interpretation and allows an adverbial like *tomorrow*:

(33) [**Vasu** poori porikk-a] Raman maavu vaangi-n-aan.
Vasu.NOM poori.ACC fry-INF Raman.NOM flour.ACC buy-PST-M.3SG
'Raman bought flour for Vasu to fry pooris.

McFadden and Sundaresan (2011) note that only PRO is allowed as the subject of vP-infinitive like the complement of *try*, and overt subjects are once again disallowed.[13]

(34) Ramani [PRO/taan/*Vasu saadatt.ai saappi.d.a] paa.tt.aan
Raman.NOM PRO/self.NOM/*Vasu.NOM rice.ACC eat.INF try.PST.3MSG
'Raman$_i$ tried [PRO$_i$ for himself$_i$/*for Vasu to eat the rice].'

Again, Tamil is different from English and similar to Greek, in that overt subjects are licensed in certain infinitives under W&L's framework. English allows PRO in an infinitive of any size, while Tamil and Greek only allow it in a vP-complement.

However, all of these languages have something in common. Tamil, Greek and English all obey an *implicational hierarchy*, in that a more deficient clause never allows a larger subject than that is possible in a larger clause. In other words, the largest possible subject in a vP-complement will never be larger than what is possible in a TP-complement. There can be no language which allows an overt NP subject in the complement of *try* but not *decide*. The fact that such an implicational hierarchy with complements of different sizes like vP and TP is strong evidence in favor of a finer-grained relationship between subject and clause size.

[13]They argue that the reflexive *taan* is an instantiation of overt PRO, exactly what we witnessed in section 3.2 above. The subject of the infinitive must be contrastively focused. They also note that it must refer to the controller and be read de se, in addition to being nominative. I do not think they conclusively rule out the possibility that it is an emphatic double, however. But if it is truly overt PRO, I treat *taan* as being the same size as PRO.

4.2 Partial control and nonexistent subjects in vP-infinitives

We have seen that TP- and vP-complement clauses in Tamil and Greek have different subject licensing properties. What is remarkable is that even more familiar languages like English care about this distinction too, which we can see based on the phenomenon of partial control (PC), first noted by Wilkinson (1971) and developed further by Landau (1999). Note that PRO appears to refer to a group containing the controller in (35):

(35) Mary$_{i}$ wanted PRO$_{i+}$ to meet at 6.

Under Wurmbrand and Lohninger (2019)'s framework, PC can only be found in infinitives as large as CP or TP, as demonstrated in the contrast below.

(36) The department chair wanted to gather at 6.

(37) * The department chair tried to gather at 6.

Control with a predicate like *try* is referred to as exhaustive control (EC). Could it be possible that PRO in (35) is slightly larger than a bare NP, perhaps projecting syntactic number features? This possibility is quite easy to rule out, as Landau (2013) demonstrates. A plural anaphor cannot be licensed in the embedded clause. PC PRO must be semantically, not syntactically, plural.

(38) * Mary wanted to introduce themselves.

Another key difference between PC and EC is that, as Landau (2015) points out, all partial control predicates are attitudinal, meaning that the subject of the predicate must be animate. This means that the table we previously saw has to be updated:

Pronouns	D-antecedent?	Expletive?	Impersonal?	Animate?	De se reading?
Strong	✗	✗	✗	✗	✗
Deficient	✓	✓	✓	✓	✓
PC PRO	✓	✗	✓	✗	✓
EC PRO	✓	✗	✓	✓	✓

Table 6: A comparison of the properties of partial and exhaustive control PRO.

Before presenting an analysis of the difference, I would like to present novel evidence from Icelandic in favor of a distinction between PC and EC PRO. The data concerns case concord in Icelandic control infinitives. As Sigurðsson (1991) has shown, PRO in Icelandic can be case-marked, via quirky case-marking of the subject. Though the controller bears nominative case, the quirky accusative case we would expect the subject to bear shows up on PRO in (39).

(39) María$_{i}$ vonast til [að **PRO$_{i}$** vanta ekki **eina$_{i}$** í tíma].
Mary.NOM.SG.FEM hopes for to lack not alone.ACC.SG.FEM in class
'Mary hopes not to be missing alone from class.' Thráinsson (2007)

The matrix predicate of the example in (39) is *hope*, which takes TP-complements under W&L's framework. Therefore, one might wonder whether such case concord would still be present with

the vP-complement of *try*. [14] What is surprising is that Sigurðsson (1991)'s case concord facts in Icelandic do not apply to *try*. In (40) below, we see that (39), with *try* instead of hope is not acceptable in the appropriate context (Höskuldur Thráinsson, p.c.). *Eina* in (40) must be in the nominative form, which is *ein*.

(40) * María$_i$ reydni til [að **PRO$_i$** vanta ekki **eina$_i$** í tíma].
Mary.NOM.SG.FEM tried for to lack not alone.ACC.SG.FEM in class
'Mary tried not to be missing alone from class.'

Indeed, the following sentence paired with the appropriate context, in which *ein* is in the nominative and there is no quirky case, is much better (Höskuldur Thráinsson (p.c.)):

(41) María$_i$ reydni til [að **PRO$_i$** vera ekki **ein$_i$** fjarverandi].
Mary.NOM.SG.FEM tried for to be not alone.NOM.SG.FEM absent
'Mary tried not to be absent alone.'

These facts seem difficult to capture under a theory of control in which PRO is present at all in vP-infinitives. Any theory in which PRO is present at all would predict the possibility of (40). This indicates the need for an even smaller subject than PRO–that is, a completely empty one.

How do we account for the above contrasts in English, in addition to Icelandic? I follow Wurmbrand (1998) in assuming that PRO is literally nonexistent in the case of *try* and other vP-complements. Its control interpretation is purely semantic, following Wurmbrand (1998).[15] The semantics is based on Chierchia (1984)'s purely semantic approach to control in which control complements are properties rather than propositions; in other words, they have no subject; the subject is semantically "added on" later in the derivation. A sample of this semantics of *try* given in (42) below.

(42) *try*(P)(x) $\Rightarrow$ P(x)
whenever x tries to bring about P, then in all the contextually relevant situations (namely those where what x tries actually succeeds), x does P

Although Chierchia intended for his semantics to apply to all control complements, it cannot be extended to partial control. However, nothing prevents it from being restricted to exhaustive control contexts. This accounts for the lack of a partial control interpretation in *try*-complements because the semantics in (42) precludes it; but when a minimal pronoun PRO is present, a partial control interpretation is possible.

(43) a. Strong pronoun: DP $>$ FocusP $>$ ϕP $>$ NP
b. Weak pronoun: FocusP $>$ ϕP $>$ NP
c. Clitic: ϕP $>$ NP
d. Nonfinite CP or TP PRO: NP
e. vP PRO: $\emptyset$

Though I present the analysis in further detail in section 5, the absence of a subject would trivially satisfy C&S's economy constraint. It would be preferable for a clause to have no subject at

[14] This is not possible to verify with *begin* or *continue*, whose complements have a different structure from that of *hope*. For instance, they do not have the complementizer *að*. The reader is referred to Thráinsson (2007) for further discussion.

[15] The reader is referred to Wurmbrand (1998) for the additional evidence in favor of this account.

all, if possible, given that it is the most efficient way to minimize syntactic structure. But if it is necessary for syntactic and/or semantic reasons–for instance, to allow partial control–then the smallest possible alternative is the reference variable NP PRO.

4.3 Diagnosing clause size via topicalization in Serbian

Perhaps the strongest evidence in favor of a tight relationship between subject and clause size comes from Serbian. Let us go over some of the basics of Serbian complementation. As Wurmbrand et al. (2020) points out, Serbian allows both nonfinite and finite complements: the bare infinitive form without *da*, and the form with agreement on the verb with *da*. Both the infinitival form of the verb in addition to the *da*-form are allowed with vP- and TP-complements, as demonstrated in (44a) and (44b). The infinitival form of the verb is not allowed in the complement of *claim*, as seen in (44c), indicating that it must be finite.

(44) a. Pokušala sam {da čitam / čitati} ovu knjigu.
tried.SG.F AUX.1SG DA read.1SG / read.INF.IPFV this book
'I tried to read this book.'

b. Odlučila sam {da čitam / čitati} ovu knjigu.
decided.SG.F AUX.1SG DA read.1SG / read.INF.IPFV this book
'I decided to read this book.'

c. Tvrdim {da čitam / *čitati} ovu knjigu.
claim.1SG DA read.1SG / *read.INF.IPFV this book
'I claimed to be reading this book.'

Now, overt subjects are not possible in the *da*-complement of *try*, though they are possible in the complement of *decide* or *claim*. (45) contains an example with *decide* and allows an overt embedded subject.

(45) Jovan je odlučio da ∅/Petar/on ode.
Jovan AUX decided DA ∅/Petar/he leaves
'Jovan decided to leave.'
'Jovan decided that Peter/he would leave.'

For Wurmbrand et al. (2020), *da* is located in v in the vP-complement of *try*, in T in the TP-complement of *decide*, and C in the CP-complement of *claim*.

At this point, we do not have enough information to determine whether the possible empty category in (45) is pro or PRO, or whether it could be both. What is surprising, however, is the fact that the complement of *decide*, in fact, in certain cases does not allow overt subjects. This can be teased apart via clause-internal topicalization–one of Satık (2022)'s tests to determine the size of a complement clause. He follows Rizzi in assuming that the topmost C layer precedes all topicalized and focalized elements, and topics are located in the left periphery preceding T. Satık's simplified hierarchy can be schematized below:

(46) CP (the location of *da* in (44c) > TopicP > TP (the potential location *da* in (44b))

It is the topmost C head in which *da* is located an example like (44c), so we would expect it to

be required for it to precede clause-internal topics.[16] Similarly, if *da* is located in T in (44b), we would expect it always be preceded by clause-internal topics. This prediction is partly borne out. According to Todorović and Wurmbrand (2016), *decide*-complements allow topicalization both before and after *da*:

(47) a. Odlučila sam [ovu knjigu]$_i$ da čitam t_i.
decided.SG.F AUX.1SG this book DA read.1SG
'I decided to read this book.'

b. Odlučila sam da [ovu knjigu]$_i$ čitam t_i.

It turns out that when a topicalized element precedes *da* as in (47a), overt NPs are disallowed, as shown in (48a). Only a null and obligatorily controlled subject is allowed. And as predicted, when a topicalized element follows *da*, it allows for an overt NP, as in (48b).[17]

(48) a. * Odlučila sam ovu knjigu da čita Ivan.
decided.SG.F AUX.1SG this book DA read.3SG Ivan
(Intended reading) 'I decided for Ivan to read this book.' ~~CP~~ > TopicP > TP

b. Odlučila sam da ovu knjigu čita Ivan.
decided.SG.F AUX.1SG DA this book read.3SG Ivan
'I decided for Ivan to read this book.' CP > TopicP > TP

In other words, in (48a), when the clause is deficient in size as a result of *da* being located in T, no overt subjects are allowed. However, when *da* is located in C–indicating that the clause is not deficient–overt subjects are once again allowed. This, again, strongly indicates that there is a relationship between subject licensing and clause size.

5 Analysis

With the empirical data established, I will now present the analysis in full detail. 5.1 introduces the reader to the most common semantics of control in the literature, which I assume. 5.2 extends C&S's notion of pronominal economy to control infinitives, arguing that it is a superior alternative to Null Case theory. 5.3 briefly explains how overt infinitival subjects reported in the literature are not problematic for my account.

5.1 The syntax and semantics of control infinitives

The semantics I will provide in this section is limited to control predicates like *claim* and *decide* that take CP- or TP-complements, and not ones that take vP-complements like *try*. I take for granted Kratzer (2009)'s syntax and semantics for PRO, in which PRO is treated as a minimal pronoun and bound within the left periphery of the infinitival clause. Her semantics is based Chierchia (1990)'s theory of obligatory control.

[16] This prediction is borne out but not relevant for our purposes. See Todorović and Wurmbrand (2016) and Satık (2022).

[17] One complication in the data in (48a)-(48b) is that my speakers preferred to topicalize the verb above the embedded subject *Ivan*. I take this to involve some kind of verb-medial focalization or topicalization. I am not sure in what way this would affect the data, if at all.

In order to account for the necessity of the de se reading, Chierchia proposed that a sentence such as *Madeline claimed to be happy* reports Madeline's self-ascription of the property of being happy. He implemented this with an individual abstractor in the left-periphery of the embedded clause. PRO itself is just a bound variable:

(49) Madeline wished PRO to eat wet cat food.
LF: Madeline wished [λx [x eat wet cat food]]

Madeline is the attitude holder in the sentence above, so the embedded clause is an attitude report. The infinitive expresses a property of individuals rather than a proposition. PRO is locally bound by an individual abstractor in the left periphery and not by the controller itself. An example of the lexical entry for *claim* and a derivation of *Madeline claimed to be clever* is given in (50), where (50b) is the infinitive built-up from the bottom up and (50c) is the matrix clause:

(50) a. $[\![\text{claim}]\!]^{c,g} = \lambda P_{<e,<st>>}\lambda x_e \lambda w_s.\forall <w',y> \in \textbf{claim}_{x,w}, P(y)(w')$ where $\textbf{claim}_{x,w} =$ {<w',y>: what x claims in w is true w' and x identifies herself as y in w'}

b. $[\![CP_2]\!]^{c,g} = \lambda x \lambda w.$ x is clever in w

c. $[\![CP_1]\!]^{c,g} = \lambda w.\ \forall <w',y> \in \textbf{claim}_{\text{Madeline,w}}$, y is clever in w'

This semantics is based on Hintikka (1969)'s semantics for attitude reports where the content of an attitude is not a set of worlds. The attitude predicate does not quantify merely over worlds; it quantifies over sets of *claim*-alternatives <w',y> such that it is compatible with the attitude holder saying she is y in w'. This semantics will ensure that a sentence in a de re scenario will end up false. This is because in the definition such as that given in (50), the attitude holder would be willing to identify refer the person in the *claim*-alternative worlds as herself. This is not possible in a de re scenario.

Clause size is intimately related to the semantics of control. As W&L point out, as an embedded clause decreases in size, it becomes more and more dependent on the matrix clause. As a result of this, the embedded subject becomes more reliant on the matrix subject; the subject, PRO must be read as a bound variable because it cannot have its own index. But CP- and TP-infinitives at least have their own subject, given the possibility of a partial reading. On the other hand, vP-infinitives lack a subject entirely, and are completely dependent on the matrix subject for semantic interpretation.

Kratzer's account is immediately able to rule out any subject of the infinitive that cannot be interpreted as a bound variable. This rules out everything from the subject position of a control infinitive apart from pronouns:

(51) * Madeline wished [the cat]/Caitlin/that dog to eat wet cat food.

However, Kratzer's account is not sufficient on its own to derive the nullness of PRO. In the vast majority of cases, overt pronouns still cannot be present:

(52) a. * Madeline wished she to eat wet cat food.

b. * I wished I/me/myself to eat wet cat food.

She is a strong pronoun in English, but this fact isn't limited to strong pronouns. PRO is almost always null: languages like Italian never allow weak pronouns or clitics in the subject position of a control infinitive, either. Although she notes that PRO is a special case of local licensing by

C, we can surely improve on this explanation. Why is this the case? Could it not have been otherwise? Kratzer gets us most of the way there, but one more key ingredient is needed for us to come up with a full-fledged alternative to Null Case theory. The key is syntactic economy.

5.2 Extending pronominal economy to PRO

Recall C&S's economy constraint to minimize syntactic structure in a derivation. Unless ruled out for independent reasons, the smallest possible pronominal subject must be picked in a clause.

(53) *Economy of Representations*
Minimize Structure

Mixed with the structure of the different kinds of pronouns I have thus far provided, this means that we have the following economy hierarchy for clausal subjects (54):

(54) **Economy hierarchy**:
$\emptyset >$ PRO $>$ Clitic $>$ Weak pronoun $>$ Strong pronoun

a. Strong pronoun: DP $>$ FocusP $>$ ϕP $>$ NP
b. Weak pronoun: FocusP $>$ ϕP $>$ NP
c. Clitic: ϕP $>$ NP
d. Nonfinite CP or TP PRO: NP
e. vP PRO: $\emptyset$

Starting from the bottom, subjectless embedded clauses are possible with exhaustive control predicates like *try*. Given that a vP-complement does not need a subject to be semantically interpreted or syntactically licensed, the economy constraint is. The subject in this case must be null, because there isn't any.[18]

Let's now look at the subject in CP- and TP-sized infinitival complements. Given the possibility of partial control in these infinitives, subjectless infinitival clauses are independently ruled out. A subject is needed. The smallest possible pronominal subject that would satisfy the syntax and semantics of a control infinitive is a reference variable, or in other words, PRO. C&S's economy constraint rules out all other possibilities, such as (52a)-(52b) above. So we need to have a PRO subject in these control infinitives.

[18]The astute reader might notice that the reflexive *taan* in Tamil occurred in the complement of *try* in (34) above. However, I do believe it is more than likely *taan* is an emphatic marker, and ultimately not a true subject. McFadden and Sundaresan (2011) note that *taan* can be used as an emphatic marker in other contexts, suffixing to the constituent it emphasizes. If this constituent ends with a nasal sound, the initial consonant of *taan* becomes voiced, leading to *daan*. They note that *taan* can co-occur with emphatic *daan*, and argue that this indicates *taan* is not an emphatic marker:

(i) Raman.daan pariccai.yai erud.a paa.tt.aan
Raman.NOM.SE exam.ACC write.INF try.PST.3MSG
'Only Raman tried to write the exam.'

(ii) Raman.daan taan pariccai.yai erud.a paa.tt.aan
Raman.NOM.SE SE.NOM exam.ACC write.INF try.PST.3MSG
'Only Raman tried for himself to write the exam.'

It is plausible that *taan* in (ii) suffixes to PRO, a phonetically null pronoun, and *taan* does not undergo voicing because PRO is phonetically null.

The conclusion in section 3.2 based on empirical evidence was that the weaker the pronoun is, the more likely it is to be null. And this is why PRO is in complementary distribution with overt pronouns; it is simply because of C&S's economy constraint. As discussed in 3.1, PRO is independently ruled out from the subject position of finite embedded clauses because it is not large enough to satisfy the needs of finite T. This restricts PRO to the right contexts, as desired.

One exception is the possibility of finite control in subjunctive clauses in the future tense, which is attested and surprisingly common: examples are seen in the Balkan languages, Persian, Hebrew, Spanish, Dogrib and Kannada.[19] An example of finite control from Landau (2013) is given in (55) below. Landau argues that PRO is present and not pro the subject of the subjunctive clause must be read de se. It must have a sloppy reading with ellipsis, just like PRO.

(55) Rina bikša me-Gil$_i$ [še-PRO$_i$ yivdok šuv et ha-toca'ot].
Rina asked from-Gil that would.check.3SG again ACC the-results
'Rina asked Gil to double-check the results.' Hebrew

The subject in this case must be null for the same reason as for the infinitives above. Given the obligatory de se reading and sloppy interpretation with ellipsis, the smallest possible pronoun that could satisfy this semantics is PRO. This rules out all other alternatives, such as strong pronouns, which need not be read de re and can have a strict or sloppy reading under ellipsis.[20]

Moreover, under my account, there are no restrictions on what kind of case PRO can have. As noted in section 1, that PRO can bear case-marking in languages like Icelandic, Russian, Latin and Italian among others is troubling for Null Case theory.

(56) María$_i$ vonast til [að **PRO$_i$** vanta ekki **eina$_i$** í tíma].
Mary.NOM.SG.FEM hopes for to lack not alone.ACC.SG.FEM in class
'Mary hopes not to be missing alone from class.' Thráinsson (2007)

One would therefore expect PRO to be licensed in finite clauses as well, but it is not. It is simply a matter of language variation whether a language allows case-marking on a bare NP or not. Although this is perhaps impossible to verify in English, one could imagine that it only allows full strong and weak pronouns (for example *it*) to be marked with case. On the other hand, Icelandic, Russian, Latin and Italian are more permissive, allowing pronouns of any size to be case-marked. This is not problematic for my theory, and the semantic requirements of PRO rule it out from occurring in most finite clauses.

One piece of evidence that Chomsky and Lasnik provide in favor of Null Case theory is based on (57a)-(57d) below. They claim that PRO is sensitive to case in a way that is not distinguish-

[19] See Landau (2004, 2013) for a more detailed discussion on finite control.

[20] One could object that PRO in this case is not a minimal pronoun because there is agreement marking on the embedded verb. This is reminiscent of languages which have inflected infinitives like European Portuguese (see Landau (2013) for further discussion):

(i) La victima intentó ser transferida/??transferido
the victim.FEM tried.3SG be.INF transferred.FEM/transferred.MASC
'The victim tried to be transferred.' Davies and Dubinsky (2008) European Portuguese

Here, there are two paths I can take. I can either assume Landau (2015)'s two-tier theory of control, in which such examples involve agreement with a null little pro that binds PRO. This pro shares syntactic features with and is obligatorily bound by the controller. Alternatively, Kratzer (2009)'s own solution involves feature transmission between the controller and the controllee. Regardless, I continue to maintain that PRO is a minimal pronoun in both finite control and inflected infinitival contexts.

able from overt nominals. The binding-theoretic behavior of reflexives and pronouns in (57a)-(57b) indicates that PRO has raised, just like overt *her*. This likewise indicates that whatever blocks movement in (57d) also blocks the movement of PRO in (57c). For Chomsky and Lasnik, the thing that blocks movement in (57d) is that *her* moves to an accusative case position after having already been assigned case.

(57) a. [PRO$_i$ to seem to herself/*her$_i$ [to be running late]] would annoy our boss$_i$.
b. [For her$_i$ to seem to herself/*her$_i$ [to be running late]] would annoy our boss$_i$.
c. * [PRO to seem to [that the problems are insoluble]] would be sad.
d. * [For her to seem to [that the problems are insoluble]] would be sad.

But it is important to note that in these examples, we are dealing with NOC PRO and not OC PRO; PRO need not corefer with *the boss* in (57a)-(57b) (David Pesetsky, p.c.). It would not be surprising for NOC PRO to have its own case requirements given that it has the syntactic properties of a strong pronoun, and is likely to be a full DP. One question that I must leave to future research to investigate in further detail is why NOC PRO must be null. I do believe this can be derived if all instances of NOC PRO in fact involve binding of OC PRO by some kind of an implicit argument, as mentioned in 3.2.

5.3 Overt subjects in infinitives

The final piece of empirical data I would like to consider are overt subjects in infinitives. Chomsky (1980) tied the possibility of nominative Case licensing to finiteness, claiming that nonfinite T cannot assign Case, but this appears to be false. For instance, McFadden and Sundaresan (2014) provide evidence that overt subjects can occur in infinitives in Tamil, Malayalam, Sinhala, Middle English and Irish. They claim that such data undermines the correlation between subject reference and clausal finiteness. Selected examples are provided in (58a)-(59b) below.

(58) a. [**Matə** teerennə issella] ləkcərekə iwərə unaa.
I.DAT understand.INF before lecture finish become.PST
'The lecture ended before I understood (it).' Sinhala
b. Ghoillfeadh se orm [**tu** me a ionsai].
would.bother it on.me you.ACC me INF attack
'It would bother me for you to attack me.' Irish

Indeed, one can even point out the existence of *for*-infinitives in languages like English as well, which allow for an overt subject to be present in the infinitive. This is distinct from the potential phenomenon of overt PRO discussed in section 3.2, because in these cases the overt subject is not interpreted as a bound variable. Thus, these examples are not relevant for the theory proposed here. I do not predict (58a)-(58b) to be impossible.

More interesting is the possibility of overt pronominal subjects in control infinitives which are interpreted as bound variables, as in (59b)-(59a). As Szabolcsi (2009) notes, the overt subject in Hungarian must be focused. The example (59b) is from McFadden and Sundaresan (2011) and the subject is in the nominative and interpreted as a bound variable. However, as David Pesetsky (p.c.) has pointed out to me, the infinitival subject in this case must be read with focus, indicating it is similar to Hungarian.

(59) a. Utálok [**én** is magas lenni].
hate.1SG I.NOM too tall be.INF
'I hate it to be the case that I too am tall.' Hungarian

b. 'That were shame unto the,' seyde sir Launcelot, '[**thou** an armed knyght to
'That were shame unto you,' said sir Launcelot, you.NOM an armed knight to
sle a nakyd man by treson].'
slay a naked man by treason.
'"That would be a disgrace on you," said Sir Lancelot, "for you, an armed knight,
to slay a naked man by treason."' Middle English

The subject must be read de se, it must have a sloppy interpretation under ellipsis, and it must be read as a bound variable. Crucially, however, the pronoun in this case must at the very least be as large as a FocusP under C&S's hierarchy. PRO cannot be focused under the framework of pronominal subjects that I have provided in this paper. For independent reasons, clitics and all smaller pronouns are ruled out from this position, and only a strong or weak pronoun can satisfy the syntactic and semantic requirements of these constructions.

6 Concluding Remarks

Before concluding, I would like to point out one more potential application of syntactic economy to infinitival subjects; in particular, it might be applied to raising constructions. One commonly held assumption is that raising is driven by Case theory, as proposed in the theory of nominal licensing by Vergnaud (1976). It is claimed that CPs don't need to be assigned Case, so they are licit in positions which don't have any Case assignment. A Case Filter-based explanation is often provided for the possibility of ECM-constructions. This yields contrasts like the ones below, in which (c)-(f) are infelicitous due to the impossibility of Case assignment.

(60) a. Sue considers Mary to have solved the problem. *ECM*
b. Mary seems to speak French well. *Raising*
c. * It seems [Mary] to have solved the problem. *Unaccusative matrix V*
d. * It was believed [Mary] to speak French well. *Passive matrix V*
e. * Mary is aware [Bill] to be the best candidate. *A*
f. * Mary's belief [it] to have been raining *N*, Pesetsky (2021), p. 19

As Pesetsky (2021), the standard account makes a strikingly false prediction: a non-nominal phrase like a CP should be acceptable in all of the bracketed positions. But it turns out that CP subjects have the same distribution as nominal phrases:

(61) a. Sue considers [that the world is round] to be a tragedy. *ECM*
b. [That the world is round] seems to be a tragedy. *Raising*
c. * It seems [that the world is round] to be a tragedy. *Unaccusative matrix V*
d. * It was believed [that the world is round] to be a tragedy. *Passive matrix V*
e. * Mary is aware [that the world is round] to be a tragedy. *A*
f. * Mary's belief [that the world is round] to be a tragedy. *N*, Pesetsky (2021), p. 19

The puzzle for the classical explanation is not limited to clausal subjects. Pesetsky points out that every type of constituent that can function as a subject in English has the same pattern as in (61) above: PPs (ex. *in this room*) and expletives, for instance. This means that the original Case-based solution for ECM constructions is not sufficient: what explains the infelicitousness of (60c)-(60f) and (61c)-(61f)? We need to start from scratch. This leads Pesetsky to propose the Exfoliation framework for the derivation of infinitives, which I will not present here.

The theory of subject economy in this paper could have applications to this puzzle as well. C&S's economy constraint only applies to pronouns. But suppose one stipulated, or somehow showed, that C&S's economy constraint applies to any subject, and not just pronouns, in the infinitival subject position. This would be an alternative, and relatively simple solution, of Pesetsky's puzzle, given that Movement would allow for a way to escape the economy constraint. In both cases (60c)-(60f) and (61c)-(61f), the DPs and CPs would be simply too large to stay in the infinitival subject position, and would have to move for the sake of syntactic economy.

To conclude, this paper has argued for an alternative to the Null Case theory of the distribution of PRO. I first showed that PRO ought to empirically be classified as a pronoun even more deficient than weak pronouns and clitics–at the very most, an NP without ϕ-features. I then showed that there is a finer-grained relationship between the different sizes an infinitive can be and their subjects. But all languages obey an implicational hierarchy, in that more deficient clauses never allow a larger subject than that is possible in a larger clause.

In order to explain why PRO is (almost always) null, I adopted C&S's notion of the syntactic economy of pronouns. I claimed that the smallest possible pronoun that can be read as a bound variable is one that is null. PRO is independently ruled out in finite clauses because it lacks the features to the needs of finite T. But nonfinite T has no such requirements, so it is economically preferable. This is able to straightforwardly derive the complementary distribution between PRO and overt pronouns in control infinitives. It is a significant improvement on the Null Case theory of the distribution of PRO.

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