An account of the variation in the rates of overt subject pronouns in Romance

Abstract: This paper examines the variation between null and overt subject pronouns found in Romance null subject languages (NSL). While it is well known that several factors regulate the distribution between these two forms, it is also well known that not all null subject languages behave the same. The contexts in which null and overt subject pronouns are required or forbidden vary across dialects, as well as their rates. This paper examines such quantitative and qualitative differences and proposes two mechanisms to explain them. In the first place, a change in progress in some varieties is responsible for the qualitative and quantitative differences found. I apply Yang’s (2000) model of language change and show that NSLs can become non-NSLs only if there is enough migration, which is what happened in the varieties undergoing the change. In the second place, following Cameron (1992) and Cameron and Flores-Ferrán (2004), I claim that priming effects also play an important role in explaining the quantitative differences across several dialects.

Keywords: null pronouns, overt pronouns, null subject languages, variation, language change, priming effects.

Running title: Variation in the rates of overt subject pronouns in Romance

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1 Introduction

Romance null subject languages (NSLs henceforth) display a variation between null and overt pronouns in subject position (NSPs and OSPs respectively). While it is well known that several factors regulate the distribution between these two forms, it is also well known that not all NSLs behave the same. The contexts in which NSPs and OSPs are required or forbidden vary across dialects, as well as their respective rates. The rates of OSPs greatly vary in different dialects, ranging from less than 20% in some varieties to more than 55% in other varieties. Despite these differences, the same variable constraints seem to be in effect in different dialects and cross-dialectal studies have found striking similarities.

This paper examines the quantitative and qualitative differences across several Romance varieties and proposes two mechanisms to explain them. In the first place, a change in progress in some varieties is responsible for the qualitative and quantitative differences found. In particular, data from Brazilian Portuguese and Spanish Caribbean varieties show that these varieties display different properties from strict NSLs. I apply Yang’s (2000) model of language change and show that an NSL can change to a non-NSL only if there is enough migration, which is what happened in the varieties undergoing the change. These varieties are precisely those that received African migration during their formation and were in touch with African languages during colonial times. In the second place, I show that the use of different pronominal forms is sensitive to priming effects: the use of an OSP favors the use of another OSP and the use of an NSP favors the use of another NSP. This phenomenon plays an important role in explaining the quantitative differences across several dialects, since it can magnify a genuine, albeit small, difference between two dialects.
This paper is structured as follows. Section 2 summarizes some of the vast previous work on subject expression in Romance. It presents an overview of the NSP and OSP rates in different dialects and a summary of the main constraints that have been found to regulate this variation. Section 3 examines some of the qualitative differences between several null subject varieties and shows that some varieties display a behavior compatible with the idea that there are two grammars (with different settings as far as null subjects are concerned) competing. I apply Yang’s model of language, which predicts when it will be possible for an NSL to change into a non-NSL. Section 4 considers the consequences of priming effects. I show that priming effects are active in several dialects and that they affect the variation between NSPs and OSPs and I argue that such effects can be responsible for some of the rate differences observed. Finally, section 5 concludes.

2 Subject pronoun expression: rates and constraints

There has been extensive sociolinguistic research on the variable use of OSPs in different Romance varieties, particularly in different Spanish dialects, and these studies have shown that there is significant variation in the overall use of OSPs. Table 1 summarizes the overall rate of OSPs found in several sociolinguistic studies for different varieties. As can be seen, the overall rate of OSPs greatly changes from dialect to dialect and, while some dialects display a low rate of OSPs, other dialects show a much higher rate: in particular, Brazilian Portuguese and Caribbean Spanish (Dominican, Puerto Rican and Cuban) varieties are at one end of the spectrum, while Mexican Spanish, Iberian Spanish and European Portuguese are at the other end.
Table 1: Overall rate of OSPs in different varieties

<table>
<thead>
<tr>
<th>Study</th>
<th>% of OSPs</th>
<th>Total number of NSPs and OSPs</th>
<th>Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>56</td>
<td>8924</td>
<td>Lira (1982: 123)</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>45</td>
<td>2122</td>
<td>Cameron (1992: 165)</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>41</td>
<td>2217</td>
<td>Otheguy et. al. (2007: 785)</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>35</td>
<td>3805</td>
<td>Otheguy et. al. (2007: 785)</td>
</tr>
<tr>
<td>Cuba</td>
<td>33</td>
<td>2778</td>
<td>Otheguy et. al. (2007: 785)</td>
</tr>
<tr>
<td>Ecuador</td>
<td>27</td>
<td>3735</td>
<td>Otheguy et. al. (2007: 785)</td>
</tr>
<tr>
<td>Colombia</td>
<td>24</td>
<td>1926</td>
<td>Otheguy et. al. (2007: 785)</td>
</tr>
<tr>
<td>Portugal</td>
<td>22</td>
<td>162</td>
<td>Barbosa et. al. (2005:44)</td>
</tr>
<tr>
<td>Spain</td>
<td>21</td>
<td>2061</td>
<td>Cameron (1992: 241)</td>
</tr>
<tr>
<td>Mexico</td>
<td>19</td>
<td>2569</td>
<td>Otheguy et. al. (2007: 785)</td>
</tr>
</tbody>
</table>

Sociolinguistic, corpus and psycholinguistic studies have also tried to identify the constraints that correlate with pronominal subject expression or omission. As mentioned before, despite the differences in rates, several studies have identified a surprisingly homogeneous behavior in different dialects and several constraints have been identified as significant in virtually all studies that address the issue.

The main constraints that have been identified as regulating the appearance of NSPs and OSPs within the envelope of variation are the following:

- Subject Continuity: the most important constraint regulating the variation between null and overt pronouns is whether there is subject continuity or not: that is,
whether the referent expressed by the pronoun is the same as the subject of the previous utterance. NSPs have been found to be systematically favored when there is subject continuity and OSPs when there is subject discontinuity. This tendency has been shown to hold in all dialects studied and for all persons, both in experimental and sociolinguistic studies. For the former, it has been found in Madrid Spanish (Alonso-Ovalle, Fernández, Frazier & Clifton, 2002), Italian (Carminati, 2002) and Catalan (Mayol & Clark, 2010). For the latter, it has been found, among many others, in Madrid (Enriquez, 1994), Puerto Rican Spanish (Cameron, 1992; Abreu, 2009), Brazilian Portuguese (Lira, 1982), Colombian Spanish (Travis, 2005), Venezuelan Spanish (Bentivoglio, 1987) and Mexican Spanish (Silva-Corvalán, 1982).

- **Context:** the preference for OSPs in Subject Discontinuity contexts is greatly affected by the linguistic and extralinguistic context. In a self-paced reading experiment, Mayol and Clark (2010) found that OSPs in Catalan were the preferred form in subject discontinuity contexts if there was no semantic or pragmatic bias towards the two possible antecedents. However, in those same contexts, if there was a bias towards the object antecedent, the NSP, and not the OSP, was the preferred form. That is, an NSP is felicitous to refer the object antecedents (that is, in subject discontinuity contexts) if there are enough contextual cues.

- **Priming:** Both NSPs and OSPs are sensitive to priming effects. That is, NSPs favor subsequent uses of NSPs and OSPs favor subsequent uses of OSPs. Priming effects will be discussed extensively in section 4. This effect has been reported in several dialects of Spanish: Madrid and New York City (Cameron and Flores-Ferrán, 2004), Colombian and New Mexican Spanish (Travis, 2007), Puerto Rican Spanish (Abreu, 2009) and Uruguayan Spanish (Carvalho and Child, 2011).
• Person and Number: Not all combinations of person and number exhibit the same rate of OSPs. In fact, in Otheguy et. al. (2007) study, this was the most important constraint. Second person formal pronouns usually exhibit the highest rate, while third person pronouns usually exhibit the lowest rate. As for number, singular subjects usually exhibit a higher rate than plural subjects (Cameron, 1992; Enríquez, 1984; Morales, 1986, Otheguy et. al. 2007).

• Genericity and specificity: this is one constraint that clearly has an effect on subject expression, but its effects change depending on the dialect. Some dialects favor the expression of second person singular OSPs to express generic statements (Puerto Rican, Chilean and Argentinean Spanish), while others (Madrid Spanish) favor NSPs in this same context (Cameron, 1997; 1992).

In sections 3 and 4 I present two mechanisms to understand the rate differences presented in Table 1. Let dialect A be the generic name for a dialect with a high rate of overt pronouns (Brazilian Portuguese or Caribbean Spanish varieties) and dialect B the generic name for a dialect with a low rate of overt pronouns (European Portuguese, Spanish from Madrid or Mexico). The first mechanisms takes as a basis the qualitative differences found across some Spanish dialects (see section 3.1) and explores the idea that the high rates of OSPs present in dialect A are the result of two grammars currently competing in this dialect (see section 3.2). The second derives the rate differences between dialects from priming effects. We will examine closely data from San Juan (Puerto Rico) and Madrid (Spain) (section 4.1) in order to explain how priming effects can magnify genuine differences between two dialects (section 4.2).
3. Language change

3.1 Qualitative variation

Apart from the quantitative differences illustrated in Table 1, Romance varieties also exhibit qualitative differences. That is, some dialects allow OSPs in contexts in which other dialects would require an NSP. Dominican Spanish is one of the varieties that allows OSPs in contexts that would yield ungrammatical sentences in other varieties. For instance, OSPs may be used as expletives and in non-finite clauses, as 1a and 1b show, taken from Toribio (2000). These sentences would be ungrammatical in most other dialects of Spanish. Also, the discourse in 1c shows a density of overt pronouns which would be highly infelicitous in, for instance, European Spanish:

(1)  
a. **Ello** quiere llover.
   ‘It wants to rain.’

b. Ven acá, para **nosotros** verte.
   ‘Come here, for **us** to see you.’

c Entre **tú** más estudias **tú** te vas proyectando mejor y estás adquiriendo más experiencia. Algo que **tú** no conoces o no conocías a través de los estudios **tú** lo vas a conocer. **Si tú** decías una palabra mal antes, **tú** ya la hablas correctamente
   ‘The more **you** study the better **you** project yourself and acquire more experience. Something that **you** don’t know or didn’t know through studies **you** begin to know. If **you** used to say a word badly before, **you** now speak it correctly.’

Moreover, these differences in the use of OSPs correlate with the use of other syntactic constructions related to the so-called ‘pro-drop parameter’ (see Rizzi (1997) for a
discussion of the properties of this parameter). For instance, unlike other Spanish varieties, word-order in Dominican Spanish is almost categorically SVO, even in contexts which would require subject inversion in other varieties, such as in matrix and embedded questions:

(2) a. Que tú piensas?
   ‘What you think?’

b. No sabía cuándo ella iría.
   ‘No know when she would go’

I did not know when she would go.

Toribio (2000) argues that Dominican Spanish is in a state of change and that it contains two grammars: a grammar with the null subject settings and a new, incoming grammar with the non-null subject settings. Similar claims are found in the literature regarding Puerto Rican Spanish (Morales, 1989) and Brazilian Portuguese (Duarte 1993; 1995 and Barbosa et. al. 2005). Duarte (1993) claims that Brazilian Portuguese is evolving from being NSL to being non-NSL. She presents some examples in which an obligatory NSP has become optional, as in 3. In other Romance varieties, these contexts (embedded subject coreferential with the main subject of the clause and left-dislocation of the subject) require an NSP. Thus, in Brazilian Portuguese, we find variation in contexts in which it used to be absent (see footnote 2). Moreover, Duarte's diachronic data shows a great increase of the rate of OSPs, from a rate of 20% in 1845 to a rate of 74% in 1992, as shown in Figure 1.

(3) a. De repenta ela sabe que ela quando criança ficava meio triste perisso.
   It may happen that she knows that she as a child would be sad for that.
b. Clarinha ela cozinha que é uma maravilha.

Clarinha she can cook wonderfully.

Figure 1: Rate of OSPs during seven periods in Brazilian Portuguese (Duarte, 1993).

Moreover, diachronic data from Andrade Berlinck (2000) also shows how the frequency of SV orders in Brazilian Portuguese has increased from 42% at the beginning of the 19th Century to an almost categorical 96% in the second half of 20th Century. The opposite has been the case for postverbal orders, which have almost disappeared. VSX orders decreased from 34% to 2% and VXS orders from 24% to 2%.

3.2 Competition of grammars

The first mechanism to explain the high rate of OSPs in some dialects is language change. The basic idea is that the high frequencies of overt pronouns in dialect A grammars (Brazilian Portuguese and Caribbean Spanish varieties) are due to changes in the settings of the null subject parameter. As mentioned, Toribio (2000) argues that Dominican Spanish is undergoing a change process and displays properties both of NSLs and non-NSL. While the
change is in progress, speakers will have both grammars at their disposal, although their respective rates will change over time. When the innovative grammar is selected, it may be that an OSP will be used in a context in which a speaker of dialect $B$ would have used an NSP.

How does the competition of grammars evolve and how do their respective rates change through time? Yang (2000) develops a model of language change and acquisition, which I briefly summarize here. Language acquisition is seen as a competition process among a population of grammars. When an input sentence $s$ is presented, a grammar $G$ is selected with a certain probability $p$. If that grammar can parse the sentence, the selected grammar is rewarded and all the others are punished. If the sentence cannot be parsed, the selected grammar is punished and all the others are rewarded. The penalty probability is what defines the fitness value of a grammar: the penalty probability of a grammar $G_i$, $c_i$ is the probability that an item $s$ in the linguistic environment cannot be parsed by $G_i$.

Language change occurs when two generations, $n$ and $n + 1$, are exposed to sufficiently different linguistic evidence, due to some factor, be it migration, real linguistic innovation or social and cultural factors affecting the distribution of the linguistic expressions in a population. Suppose that the expressions used in a linguistic environment—let's call them $E_{1(G_1,G_2)}$—come from two different grammars, $G_1$ and $G_2$. Suppose that a proportion $\alpha$ of $G_1$ expressions are incompatible with $G_2$ and a proportion $\beta$ of $G_2$ expressions are incompatible with $G_1$.

At generation $n$, a proportion $p$ of expressions are generated by $G_1$ and a proportion $q$ are generated by $G_2$, where $p + q = 1$. This constitutes the linguistic evidence for the next generation $n + 1$. The penalty probabilities of $G_1$ and $G_2$, $c_1$ and $c_2$, correspond to $\beta q$ and
\( \alpha \). We can then compute \( p' \) and \( q' \), the weights of \( G_1 \) and \( G_2 \) respectively, as internalized by the learners of the next generation \( n + 1 \), which may be different from the weights of the previous generation. In particular, the evolution of \( p' \) and \( q' \) can be approximated as (4), or (5) if we rewrite the equations in terms of \( \alpha \) and \( \beta \).

(4) \[
\begin{align*}
p' &= \frac{c_1}{c_1 + c_2} \\
q' &= \frac{c_2}{c_1 + c_2}
\end{align*}
\]

(5) \[
\begin{align*}
p' &= \frac{\alpha \mu}{\alpha \mu + \beta q} \\
q' &= \frac{\beta q}{\alpha \mu + \beta q}
\end{align*}
\]

In order for \( G_2 \) to overtake \( G_1 \), \( q \), the weight of \( G_2 \), needs to increase in successive generations, until the weight of \( G_1 \) eventually reaches 0. Expressed in other terms, \( G_2 \) overtakes \( G_1 \) if \( \beta > \alpha \), which has the following corollary: once a grammar is on the rise, it is unstoppable. Moreover, the weight of \( G_2 \) increases over time, yielding an S-shaped curve, as frequently described in the language change literature (Kroch, 1989).

In the case at hand, in order for a language to change from being NSL to being non-NSL, there need to be more sentences in the linguistic evidence that are incompatible with the \( G_1 \) grammar (the null-subject grammar) than with the \( G_2 \) grammar (the non null-subject + rigid SVO). In the dialect that is changing we cannot observe \( \alpha \) and \( \beta \) directly, but only \( \alpha p \) and \( \beta q \). However, we can observe \( \alpha \) and \( \beta \) in varieties in which there is no change in progress, that is, in stable NSLs and non-NSLs.

In order to estimate \( \alpha \), we need the percentage of items in a \( G_1 \) grammar which are incompatible with a \( G_2 \) grammar. This will be sentences with a null subject and also
sentences with those features that are known to correlate with the availability of null subjects, namely postverbal subjects (Rizzi, 1997), such as the Spanish examples in (6).

(6)    a. Llegué a las 3.
       ‘Arrived-1sg to the 3.’
       I arrived at 3.

    b. Llegó Juan a las 3.
       ‘Arrived-3sg Juan to the 3.’
       Juan arrived at 3.

These counts are fairly easy to find in sociolinguistic or acquisition studies. For example, table 2 shows the rates of null subjects for Catalan (Casanova, 1998), Italian (Bates (1976) and Lorusso, Caprin, Guasti (2005)) and Mexican Spanish (Silva-Corvalán, 1994). The first two studies mentioned also include counts of postverbal subjects in Catalan and Italian. Although there is some variation in the data, these three dialects show a comparable behavior. In the first two studies, $\alpha$ is 80.6% and 74%. Averaging these results, $\alpha$ can be estimated at around 77.3%.

Table 2: Percentage of $G_1$ items incompatible with a $G_2$ grammar

<table>
<thead>
<tr>
<th></th>
<th>% NSPs</th>
<th>% Postverbal Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalan (Casanova, 1998)</td>
<td>72</td>
<td>8.6</td>
</tr>
<tr>
<td>Italian (Bates, 1976)</td>
<td>51</td>
<td>23</td>
</tr>
<tr>
<td>Italian (Lorusso et. al., 2005)</td>
<td>74</td>
<td>NA</td>
</tr>
<tr>
<td>Mexican Spanish (Silva-Corvalán, 1994)</td>
<td>59</td>
<td>NA</td>
</tr>
</tbody>
</table>
In order to estimate $\beta$, we need the percentage of items in a $G_2$ grammar which are incompatible with a $G_1$ grammar, such as the examples in (1), (2) and (3) (see section 3.1). This includes sentences with expletive subjects, (1a), infinitival subjects, (1b), preverbal subjects in contexts where an NSL would display a postverbal subject (i.e. in questions), (2), left-dislocated subjects followed by an OSP, (3), and cases of overuse of OSPs, (1c).

The frequency of these constructions is somewhat more complicated to obtain. Yang (2002) estimates the appearance of expletive subjects at 1.2% in English. Infinitival subjects and left-dislocated subjects followed by pronouns are not very frequent constructions either. We can safely assume that they are not more frequent than expletive subjects and approximate their frequency at 1% at most. It is also not obvious how to estimate the percentage of preverbal subjects which would be postverbal in an NSL and the rate of overuse of OSPs.

For the former, we can assume that most of the postverbal subjects found in Italian or Catalan data would be ungrammatical or dispreferred if placed preverbally. As was shown in table 2, the rate of postverbal subjects found in two studies for Catalan and Italian was 8.6% and 23% respectively. Thus, averaging the data from these two studies, we can estimate at 15.8% the percentage of items with preverbal subjects which would be incompatible with an NSL.

For the latter, it is hard to decide what constitutes an overuse of OSPs. However, we can get a good approximation looking at data from a topic-drop language, such as Chinese. In Chinese, both subjects and objects can be dropped when they refer to the discourse topic and Chinese topic-drop is more restricted than Romance pro-drop. For instance, if a topic phrase has been fronted in Chinese, an NSP is only possible if the topic phrase is an adjunct
and, thus, it is not a possible referent of the NSP. In contrast, if the topicalized constituent is an argument of the verb, the subject cannot be dropped.

The instances of pro-drop in Romance are roughly a superset of the instances of topic-drop in Chinese. It is a superset because NSPs in Romance do not have to refer to a previous topic, but can refer to a less salient entity depending on the context. In addition, a pronominal form that refers to a previous topic will most likely be expressed through an NSP in Romance because NSPs have a tendency to refer to previous subjects and syntactic subjects tend to act as topics (Vallduvi, 1992). We can assume that most OSP referring to a topic in a null-subject language would be felt as ‘unnatural’ and would be counted as a case of overuse of an OSP\textsuperscript{vi}. Since the rate of subject drop in Chinese is 50% (Yang, 2003), we can estimate at 50% the rate of overt pronouns in a G\textsubscript{2} grammar which would be incompatible with a G\textsubscript{1} grammar (which would count as an ‘overuse’ of OSPs in a G\textsubscript{1} grammar).

The counts of $\beta$, the percentage of G\textsubscript{2} items incompatible with a G\textsubscript{1} grammar, which are summarized in table 3, adds to 69%. That is, $\beta$ can be estimated at around 69%. We see, then, that the estimated values of $\alpha$ (77.3%) and $\beta$ (69%) are quite close to each other. In fact, there are many stable NSLs and non-NSLs so it is plausible to think that they cannot be easily overcome by other grammars. If so, what can we say about the varieties of Spanish and Portuguese that appear to be undergoing a change?
It has been observed that Popular Brazilian Portuguese, the variety spoken by the rural and working class, presents significant differences with standard Brazilian Portuguese. Several authors have argued that this dialect has a creole or semi-creole origin, although it is open to debate whether a creolization process took place and the degree and scope of this alleged process (see Tarallo (1993) for some discussion).

Guy (1981) argues that some of the properties of Popular Brazilian Portuguese could not have arisen from a natural language change and claims that this dialect originated in a creole language spoken by African speakers in the colonial period, which subsequently underwent a process of decreolization. Brazil had the largest proportion of slaves displaced to the New World, around 3.6 million people according to Curtin (1969). These slaves formed the entire labor force in agriculture and mining and, at the end of the colonial period, in 1817, African population represented 75% of the population. Therefore, during the period in which the foundations of Popular Brazilian Portuguese were being laid, Afro-

Table 3: Estimate of the percentage of \( G_2 \) items incompatible with a \( G_1 \) grammar

<table>
<thead>
<tr>
<th>Contexts</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expletive subjects</td>
<td>1.2</td>
</tr>
<tr>
<td>Infinitival subjects</td>
<td>( \approx 1 )</td>
</tr>
<tr>
<td>Left dislocation + OSP</td>
<td>( \approx 1 )</td>
</tr>
<tr>
<td>Preverbal subjects in questions + other contexts in which postverbal would be preferred</td>
<td>( \approx 15.8 )</td>
</tr>
<tr>
<td>‘Overuse’ of OSPs</td>
<td>( \approx 50 )</td>
</tr>
<tr>
<td>Overall</td>
<td>( \approx 69 )</td>
</tr>
</tbody>
</table>
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Brazilians were the largest group.

One of the linguistic variables studied by Guy and considered incompatible with a natural language change is the variable agreement found in Popular Brazilian Portuguese within a noun phrase or between subject and verb. Guy found that, within a noun phrase, the first word of the NP was almost always marked for plural, while other positions disfavored plural marking. This type of rule has no precedent in the history of Portuguese and Romance languages and does not easily lend itself to a natural change account. In contrast, this same pattern is found in a number of creole varieties of Portuguese and Spanish. The hypothetical Brazilian proto-creole probably lacked agreement, as most creoles do, and would use some NP-initial element to express plurality. This is precisely the pattern found in many West African languages, which were the native languages of the African people brought to Brazil in colonial times.

Also, interestingly, some of the linguistic variables studied by Guy (1981), such as variable agreement, are shared between Brazilian Portuguese and the Caribbean Spanish dialects, and not with the rest of the Spanish-speaking world. In fact, the Caribbean was the region of the Spanish Empire which used slave labor most heavily. Holms (2004) analyzes both Popular Brazilian Portuguese and Nonstandard Caribbean Spanish as semi-creoles, or partially restructured languages, which have some features of both creoles and non-creoles. According to him, these varieties are different both from unrestructured overseas dialects (Quebec French or Chilean Spanish) and from completely restructured creole languages (Guyanese Creole English and Palenquero Creole Spanish). The ratio between native and non-native speakers of the source language during the first century of creation of the new dialect seems to be the most important factor in determining in which group it will fall. In unrestructured dialects, native speakers were the vast majority. In restructured creoles, non-
native speakers were a vast majority. In partially restructured dialects, there was a majority of non-native speakers, but also a significant percentage of native speakers (around 30-40%). Holms also points out that the lack of subject inversion in questions is common in the Atlantic creoles and in the African substrate languages.

The idea I entertain is that Brazilian Portuguese and Spanish Caribbean varieties began to change due to the migration of African people during colonial times, whether or not there was a real creolization process\textsuperscript{vii}. Following Yang (2007), a language change due to migration can be modeled using equations coming from population genetics. Population genetics is interested in modeling the evolution of different alleles of the same gene within a population. In particular, population genetics deals with what happens when the proportions of different alleles change due to migration. In the so-called island model, there are two alleles \(A\) and \(a\), \(A\) being favored over \(a\). Their respective frequencies are \(p\) and \(q\) (or \(1-p\)) and their respective fitness values are 1 and 1-\(s\), where \(s\) is \(\beta-\alpha\), the advantage of one grammar over the other. If the island receives some migration \(m\) from the continent, in which only allele \(a\) is present (and, therefore, \(p\) is 0 for this population), \(p\) will change in the island after migration as in (9) and the evolution of \(p\) follows the equation in (10) (Hartl and Clark, 1989):

\[
\text{(9)} \quad p' = p \cdot (1-m)
\]

\[
\text{(10)} \quad p' = \frac{p \cdot (1-m)}{1-(1-p)s}
\]

From these equations, it can be shown that if \(m \geq s\), i.e., if the percentage of migrants is greater than the fitness advantage of the local language, the incoming variety will take over the local variety. In our case study, if the proportion \(m\) of immigrants speaking a non-NSL variety is greater than the fitness advantage \(s\) that an NSL variety has
over a non-NSL variety, the incoming variety (non-NSL) is predicted to take over the local NSL variety. As we have seen, the fitness values of NSLs and non-NSLs varieties are quite similar, so $s$ is certainly smaller than the proportion $m$ of immigrants in Brazil and the Caribbean that spoke a creole, or a non-NSL variety, during colonial times. It is, then, expected that these varieties will lose null pronouns and will go through a period in which they exhibit properties of both NSLs and non-NSLs.

Let me illustrate the rate of change this model would predict. $P$ is the frequency of the non-NSL grammar and, for the sake of argument, let us suppose that, initially, it is set to 0 (that is, the non null-subject grammar is not present in the environment prior to migration). Moreover, we have estimated the fitness advantage of the null subject language at 0.08 (77% - 69%). As for migration, let us use a conservative estimate of 0.2. Figure 2 shows the rate of change. The non null-subject grammar increases at each generation, slowly replacing the competing non null-subject grammar.

Figure 2: Estimate of the weight of a non null-subject grammar in presence of migration. The X-axis denotes the number of generations.
To sum up, I have argued that some of the OSP rate differences among several varieties are due to language change. Yang’s model of language change predicts that NSLs should be stable against non-NSLs. However, they can be overcome if there is enough migration (in particular, if migration is greater than the language fitness advantage). It is, therefore, not a coincidence that the Romance varieties with higher rates of OSPs are spoken in those areas that received a greater number of African migrants in the times of their creation.

4 Priming effects

The second mechanism I explore in order to explain the rates difference is the following: priming effects are at least partly responsible for the rate differences between a dialect $A$ and a dialect $B$. Priming is “the tendency to repeat syntactic structure across otherwise unrelated utterances” (Branigan, 2007, page 1) and it has been found in many sociolinguistic and psycholinguistic studies of several phenomena: for instance, see Branigan, Pickering and Cleland (2000) for syntactic priming, Poplack (1981) for priming effects in the expression of plural markers in Puerto Rican Spanish, and Scherre (2001) for plural marking in Brazilian Portuguese.

Priming effects are also known to influence subject expression in null-subject language in the following way: using an OSP triggers more uses of OSPs, while using an NSP triggers more uses of NSPs. As mentioned in section 2, such an effect has been documented in numerous studies, such as Flores-Ferrán (2002), Travis (2007), Abreu (2009) and Carvalho and Child (2011), among others.

The next section presents data for two dialects which sit at opposite ends of the spectrum illustrated by Table 1: Puerto Rican Spanish, with a high rate of OSPs, and
Madrid Spanish, with a low rate of OSPs. In spite of the differences, it will be shown that similar constraints are at play in both dialects, although there are also genuine differences between them. Priming effects will also be shown to be important in order to understand the data. Section 4.2 shows how priming effects can account for some of the rate differences of these two dialects.

4.1 A case study: subject expression in Madrid and Puerto Rican Spanish

In his sociolinguistic study, Cameron (1992; 1997) compared his own data for Puerto Rican Spanish and data from Madrid Spanish from a collection of interviews (Esgueva and Cantarero, 1981). The participants in both studies were comparable in terms of age and socio-economic status. As mentioned, the overall percentage of OSPs is much higher in San Juan than in Madrid: 45% vs. 21%. This is the case for every pronoun, except for the second person singular pronoun. This pronoun can be used to refer to one of the participants of the conversation, [+specific] you, or can also be used generically, [-specific] you. The two dialects studied by Cameron treat these two types of second person singular pronouns differently: the two dialects show a similar rate when it is [+ specific], but not when it is [-specific]. In the latter situation, there is an increase of pronominal subjects for the Puerto Rican data (69%) and a decrease for the Madrid data (19%), as summarized in table 4.
Table 4: Second person singular OSPs in Puerto Rican and Madrid Spanish (Cameron 1992; 1997)

<table>
<thead>
<tr>
<th>Category</th>
<th>% of OSPs in San Juan</th>
<th>% of OSPs in Madrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>45</td>
<td>21</td>
</tr>
<tr>
<td>[+specific] you</td>
<td>48</td>
<td>40</td>
</tr>
<tr>
<td>[-specific] you</td>
<td>69</td>
<td>19</td>
</tr>
</tbody>
</table>

Cameron identified Subject Continuity as the most important constraint regulating the appearance of NSPs and OSPs. As explained in section 2, Subject Continuity is the configuration in which the pronoun under study (called the target) refers to the previous subject (called the trigger) and Subject Discontinuity is the one in which the pronoun does not refer to the previous subject. Table 5 shows the data according to this condition in both dialects. It can be observed that in both dialects Subject Discontinuity favors the expression of the OSP, which is compatible with the psycholinguistic experiments mentioned in section 2. However, the rate of overt pronouns is still nearly twice as high in Puerto Rico than in Madrid in the two categories.

Table 5: Distribution of OSPs and NSPs in Subject Continuity and Subject Discontinuity contexts (Cameron, 1992)

<table>
<thead>
<tr>
<th></th>
<th>Madrid</th>
<th>San Juan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Continuity</td>
<td>% Discontinuity</td>
</tr>
<tr>
<td>OSPs</td>
<td>11</td>
<td>30</td>
</tr>
<tr>
<td>NSPs</td>
<td>89</td>
<td>70</td>
</tr>
</tbody>
</table>
Although the rates are very different, Cameron argues that the strength of the constraints on the variation is the same. He argues this on the basis of the Varbrul weights of his statistical analysis, which:

“[…] provide a measure of the strength of a given constraint on variation which is relative to other constraints within the same domain as they apply within the dialect or group of speakers being analyzed. Therefore, it is possible for two dialects or groups of speakers to exhibit strikingly different rates of the occurrence of a given variant, and yet to share similar Varbrul weights for the strength of factors which constrain the presence of this constraint” (Cameron, 1992, page 227).

The Varbrul weights for Subject Continuity and Discontinuity in both dialects in Cameron's study are shown in table 6. Weights greater than .5 indicate that the constraint favors the use of the form, while weights smaller than .5 indicate that the constraint disfavors the use of the form. Subject Discontinuity favors OSPs in both dialects to the same degree and Subject Continuity disfavors OSPs in both dialects also to the same degree.

Table 6: Varbrul weights for OSP expression (Cameron 1992; 1997)

<table>
<thead>
<tr>
<th></th>
<th>San Juan</th>
<th>Madrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discontinuity</td>
<td>.64</td>
<td>.65</td>
</tr>
<tr>
<td>Continuity</td>
<td>.34</td>
<td>.34</td>
</tr>
</tbody>
</table>

Thus, although the rates of pronominal expression are very different in the two
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dialects, the weights are very similar. Cameron offers a speculative explanation of this fact. In the grammar of a language, both the overall rate with which a particular variant occurs and the Varbrul weights associated with the constraints of variation are defining features of this grammar. If there is a change in the weight of a constraint regulating a variation, this may result in a change of the rate of the distribution of this variation, which may, in turn, serve to assign new weights to the other constraints of the variation. However, if these weights are resistant to change, a way of maintaining the values would be to increase or decrease the overall expression rate of the variant involved. For the null/overt variation, this idea is translated as follows:

“At some point in time, the effect of Nonspecificity on second person tú (‘you’) changed in various dialects of Spanish. In order to maintain the values of the Varbrul weights associated with other constraints in the language, such as Switch Reference[^x], the overall rate of pronominal expression increased or decreased as the case may be. This, in turn, served to maintain the value of the weights associated with the constraints of variation.” (Cameron, 1992, page 273).

In the next section, I will explore this idea in connection with priming effects, which are illustrated in Table 7, from Cameron (1992), for Madrid and San Juan dialects. This table shows the percentage of singular OSPs cross-tabulated by their trigger; that is, by whether the previous subject was an NSP or an OSP. Each of the cells in the OSP row is higher than the corresponding cell in the NSP row: that is, for each column, if the trigger is an OSP, we find more OSPs afterwards than if the trigger is an NSP. In addition, this priming effect is stronger in Subject Continuity contexts than in Subject Discontinuity contexts. In the former, priming effects are significant for both dialects: both in Madrid and San Juan, OSP triggers, in contrast to NSP triggers, favor OSP targets. By contrast, in the
latter, priming effects are only significant for the Puerto Rican Spanish data, and not for the Madrid data. In Puerto Rican Spanish, there is again a significant priming effect, such that OSPs lead to more OSPs and NSPs to more NSPs.

Table 7: Percentage of overt singular pronouns in Madrid and San Juan: cross-tabulation of trigger status by continuity/discontinuity condition (Cameron, 1992)

<table>
<thead>
<tr>
<th>Trigger is</th>
<th>Madrid</th>
<th>San Juan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both</td>
<td>Continuity: 14</td>
<td>Continuity: 35</td>
</tr>
<tr>
<td></td>
<td>Discontinuity: 38</td>
<td>Discontinuity: 66</td>
</tr>
<tr>
<td>OSPs</td>
<td>Continuity: 24</td>
<td>Continuity: 47</td>
</tr>
<tr>
<td></td>
<td>Discontinuity: 41</td>
<td>Discontinuity: 72</td>
</tr>
<tr>
<td>NSPs</td>
<td>Continuity: 11</td>
<td>Continuity: 26</td>
</tr>
<tr>
<td></td>
<td>Discontinuity: 37</td>
<td>Discontinuity: 63</td>
</tr>
</tbody>
</table>

Now that we have seen the relevant data, let us turn to an explanation of rate differences based on priming effects.

4.2 Back to priming effects and rate differences

In this section, I explore the following idea: priming effects are responsible for (at least, part of) the rate differences between a dialect A and a dialect B.

If priming is thought to be a cross-linguistic phenomenon and, in fact, it has been documented in many null-subject varieties, how can it be responsible for the different rates? The answer is that priming effects cannot generate different rates of pronoun expression in two dialects just by themselves, but they can if there is a genuine difference between the two dialects, even if this difference is small. That is, priming effects can magnify relatively small differences between dialects in the following way. If a particular form is used in dialect A, this use will prime other instances of the same form and, as a consequence, its
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overall rate increases. If, in a particular context $c$ of dialect $A$, OSPs become highly favored, they will get primed more often, including outside the context that initially triggered them. These primed instances can, in turn, still prime other instances. That is, a "snowballing" effect may occur and, therefore, the overall rate of OSPs will increase in the whole of this linguistic system. In contrast, although priming will also take place in dialect $B$, since OSPs will not be favored in context $c$, the priming will not happen as often.

It is plausible to think that, if a language has both OSPs and NSPs, NSPs will be preferred to OSPs due to an economy principle (such as, for instance, the ‘Minimize Structure’ principle proposed by Cardinaletti and Starke (1999) precisely in connection with overt and null pronouns in NSLs). However, priming effects may alter this asymmetry between NSPs and OSPs: a primed OSP can be preferred to an unprimed NSP. The form that has been used to refer to an antecedent can become a temporary convention to refer to that particular referent. That is, the initial advantage of NSPs as the maximally economical form may be leveled by OSPs, if they have been primed by another OSP. In addition there are reasons to believe that OSPs can be particularly efficient primers. Previous research has shown that marked, surprising forms are better primes and that structural priming is enhanced by lexical repetition (Pickering and Branigan, 1998). Both properties are found in OSPs: they are the marked form and they involve lexical repetition, unlike repetition of NSPs, which is purely a structural phenomenon.

In the case of Puerto Rican Spanish, a good candidate for a triggering context would be the association between OSPs and second person singular pronouns to express generic statements (recall that 69% of generic second person subjects were expressed through OSPs). Most instances of second person singular pronouns express generic statements (Cameron, 1992) and the increase of OSPs in this context could spread to other contexts.
(which in principle do not favor OSPs) and raise their overall rate. In contrast, since this association does not take place in Madrid Spanish, priming of OSPs will not occur as often.

Let me show an estimate of the rate differences that can be achieved by priming effects initiated by the association between OSPs and generic pronouns. The relevant data, coming from Cameron (1992), is summarized in table 8. If an OSP is followed by another pronoun, this second pronoun has a probability of 55% of being an OSP (and a 45% of being an NSP, Cameron 1992: 190). Recall that the overall probability of OSPs in Puerto Rico is 45% (cf. table 1) and, therefore, being primed increases this probability by 10 points, a modest but noticeable difference. In addition, 2nd person [-specific] OSPs represented 6.1% of all instances of NSPs and OSPs in the data from San Juan (in contrast, they represented only 1.3% of the Madrid data).

For the sake of the argument, let us suppose that priming can survive after four rounds: that is, a primed OSP can subsequently prime another OSP, which can subsequently prime another OSP, etc. Moreover, while the original primer can be a 2n person [-specific] OSPs (or another context which favors OSPs), it can be the case that primed OSPs are found in a completely different context.

As summarized in table 9, if the 55% probability of being primed remains stable, in the second round, this dialect will have a 3.3% of primed OSPs, in the third round, 1.8%, and, in the fourth 1%. Overall, adding the four percentages, the increase of OSPs would be of 12.2%. Thus, a small difference between two dialects can eventually cause important differences in the relative rates of two forms when priming effects are at work, even if they are only at work 55% of the time.
Table 8: Second person [-specific] OSPs and primed OSPs in San Juan (Cameron, 1992)

<table>
<thead>
<tr>
<th>2nd person [-specific] OSPs</th>
<th>6.1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primed OSPs</td>
<td>55%</td>
</tr>
</tbody>
</table>

Table 9: Estimate of the rate of increase of primed OSPs.

<table>
<thead>
<tr>
<th>First round</th>
<th>6.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second round</td>
<td>55% of 6.1 = 3.3</td>
</tr>
<tr>
<td>Third round</td>
<td>55% of 3.3 = 1.8</td>
</tr>
<tr>
<td>Fourth round</td>
<td>55% of 1.8 = 1</td>
</tr>
<tr>
<td>Overall increase</td>
<td>6.1+3.3+1.8+1 = 12.2%</td>
</tr>
</tbody>
</table>

It is interesting that, as mentioned in section 4.1, in Cameron's data, summarized in Table 7, priming effects are not equally strong in Subject Continuity and Subject Discontinuity contexts: they are particularly strong for Subject Continuity, and not so strong for Subject Discontinuity. In the data for Madrid Spanish, the priming effect was statistically significant only in the Subject Continuity context and, in San Juan, although it was significant for both, Subject Continuity and Discontinuity contexts, the difference of OSP expression between primed and non-primed contexts was 21% for Subject Continuity, and only 9% for Subject Discontinuity. I believe that this is related to the fact that, in Subject Continuity contexts, there is one clearly favored form, the NSP, while in Subject Discontinuity contexts there is no such clearly favored form; rather, the preferred form depends much more on contextual cues or biases.
As mentioned before, NSPs are clearly favored in cases of Subject Continuity. There is one favored form and there is room for priming effects to alter this preference. That is, a primed OSP may be used in a situation in which in principle an NSP was expected. This would explain why, in table 7, we find twice as many Overt-Overt sequences (24% in Madrid and 47% in San Juan) than Null-Overt sequences (11% in Madrid and 26% in San Juan) in Subject Continuity contexts. As mentioned before, the form itself becomes temporally associated with the referent, which participants in the conversation use as a convention to refer to a particular antecedent, temporally overriding the pragmatic constraints that regulate the distribution of NSPs and OSPs.

The situation is quite different in Subject Discontinuity contexts, in which priming effects play a relatively minor role. First, psycholinguistic studies (Mayol and Clark, 2010) have shown that which form is preferred in Subject Discontinuity contexts greatly depends on the context and whether there is semantic or pragmatic biasing towards one of the two referents. In absence of biasing, the use of OSPs is preferred. However, if there is enough semantic or pragmatic bias towards the object referent, an NSP can be used to refer to this object referent. That is, in Subject Discontinuity contexts, there is already much more variation between the two forms, since the absence or presence of contextual information regulates which pronoun will be used and this leaves less room for priming effects to appear\textsuperscript{xii}. Second, the nature of Subject Discontinuity contexts, in which the referents of two consecutive subjects are different, does not allow for the association between a particular form and a particular referent.

Although it is clear that priming has an effect on the choice of pronouns, it is also clear that it does not \textit{always} have an effect; that is, that there are many appearances of non-primed forms. This fact should not be surprising for two reasons. First, it is well-known
that priming effects are temporally limited, although their duration is still under debate. Second, even in highly controlled psycholinguistic experiments, priming never determines which form is uttered, but it merely alters their relative likelihood, sometimes in a weak but consistent way (see Branigan (2007) for discussion). As shown in this section, priming effects can magnify a small difference between two dialects and cause their rates to differ significantly.

5 Conclusion

Null-subjecthood is not displayed uniformly across NSLs: there are both quantitative and qualitative differences, some of which were reviewed in sections 2 and 3. However, even in dialects that display very different rates of OSPs, the main constraints that regulate this variation are the same and have the same weight. It is, therefore, not obvious how to account for the similarities, while at the same time explaining the differences among null-subject varieties. The goal of this paper is to show that even if the same constraints are in effect in all dialects, two independent mechanisms can account for the rate differences.

The first mechanism is language change; that is, some dialects are undergoing a process of change and are currently in a transition state from being an NSL towards being a non-NSL with rigid SVO order. Yang’s (2000) model of language change predicts that NSLs and non-NSLs should be stable grammars, given that each grammar has a similar percentage of items incompatible with the other grammar. However, this stability can be affected by migration. It is then not a coincidence that those varieties which exhibit higher rates of OSPs, qualitative differences with other dialects and features of non-NSLs (Caribbean Spanish and Brazilian Portuguese) are the same varieties whose time of
formation co-occurred with huge migration processes.

The second mechanism derives the rate differences across dialects from priming effects. Once a particular pronominal form becomes favored in a particular linguistic context, it gets primed more often and, thus, its overall rate increases. Cameron's (1992) data for Puerto Rican and Madrid Spanish fit nicely with this idea. The two dialects are very similar in that the main constraint that regulates subject expression (i.e. Subject Continuity) has the same weight in both dialects. However, priming effects amplify their differences and cause a small change in the use of a particular type of pronoun (such as an increase of OSPs to express generic statements) to spread to the whole system.

NOTES

i The syntactic properties of null and overt pronouns have been object of study since the beginnings of generative grammar. The interested reader is referred to Jaeggli and Safir (1989) for a collection of classic papers and Barbosa, Duarte and Kato (2005) and references therein for recent work. In this paper, I remain agnostic about the syntactic nature of null and overt pronouns and I simply regard them as two forms which might, in principle, compete for the same position.

ii Note that only cases in which there is actual variation between the two forms will be considered; that is, contexts in which both forms are, in principle, possible. Thus, I do not consider contexts in which one of the two forms is compulsory: for instance, OSPs are necessary if the subject has been focused, or NSPs are compulsory in a coordination or to refer to a matrix subject (see Cameron (1992) for a list of contexts outside the envelope of variation because either of the two forms must be obligatorily used).

iii See Flores-Ferrán (2007) and Cameron (1992) for comprehensive literature reviews on this topic.

iv The reader is referred to the original paper for all the mathematical details.

v As an anonymous reviewer points out, this claim is too categorical. While this is clearly the case for some postverbal subjects (i.e. those appearing in questions or unaccusative constructions), it is also true that there is some amount of free variation between SV and VS orders. However, this does not affect the way I estimate the percentage of preverbal subjects which would be postverbal in an NSL. In a given corpus of an NSL, a number of the actual VS sentences would be felicitous with a preverbal subject. However, it is also the case that a number of the actual SV sentences would be felicitous with a postverbal subject. So, at the end, we would end up with a very similar rate of subjects which would be postverbal in an NSL.

vi As an anonymous reviewer rightly pints out, some OSPs can felicitously refer to a previous topic (particularly if they have been primed, cf. Section 4.1). Likewise, there are also NSPs referring to non-topics. In order to do our estimate, we can suppose that both “exceptional” cases cancel each other out (see also footnote v) and, thus, consider that the rate of overuse of OSP roughly equals the rate of topic drop in Chinese.
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\[\text{See Klee and Lynch (2009) for an overview of the contact between Spanish and African language and Perl (1998) for more arguments in favor of the influence of African languages on Spanish. I thank an anonymous reviewer for pointing out these references.}\]

\[\text{Cameron refers to Subject Continuity and Discontinuity as Same and Switch Reference, respectively.}\]

\[\text{That is, Subject Discontinuity.}\]

\[\text{An anonymous reviewer asks whether OSP priming is really structural or purely lexical. Unfortunately, I don’t have an answer to this question. For my purposes, it is enough to show that there exists some kind of priming, although it is an interesting research question what is exactly triggering the priming.}\]

\[\text{In fact, see Carvalho and Child (2011) for some evidence that priming effects can actually get stronger after the appearance of each primed form. Thanks to an anonymous reviewer for pointing this out.}\]

\[\text{A similar point is made in Filiaci (2010), who shows that while Spanish NSPs have a clear bias, the bias is much milder for OSPs.}\]

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