RERANKING CONSTRAINTS

Coda obstruent devoicing
in the acquisition of English phonology
by Polish speakers

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Supervisor

Dr WYN JOHNSON

TOMASZ OBIAŁA
obiala@hotmail.com

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Table of contents

Chapter 1: Introduction

Polish and English are two languages within the Indoeuropean family. The former belonging to the West Slavic subgroup and the latter to the West Germanic one. Although the two are related, there is a vast number of phonological differences between them. They include, among many others, very easily tangible contrasts in vowel length (Polish does not differentiate between long and short vowels whereas English does), differences in the system of consonants between the two (e.g. English has the dental fricatives /ð/ and /θ/ which Polish lacks while Polish has palatal fricatives /ʒ́/ and /ɕ/ which are absent in the phonology of English etc.). The difference that is crucial for this analysis, however, is concerned with the realization of [+voice] coda obstruents.

If we want to simplify the issue it is valid to say that in Polish all [+voice] obstruents are devoiced in a prepausal coda position. In English, on the other hand, this process does not apply and phonologically speaking, phonemes such as /b/, /g/ or /d/ which are [+voice] underlyingly are bound to maintain their voicing status. Such a difference triggers many problems that second language learners have to face. In this study we are going to look at this issue from the perspective of Polish learners acquiring English as their second language.

The present research will investigate how successful Polish learners are at acquiring English phonology. Nevertheless, this will be done on the basis of coda obstruent devoicing only. The aspects of acquisition to be analyzed will include checking the validity of the hypotheses formulated by various scholars (as given in 3.2) within the framework of Optimality Theory (OT). In the research below this theory was given priority over others such as the rule-based approach or government phonology approach mostly due to its better capability of showing how the interlanguage changes as we move from lower-level students towards the proficient ones. This will be captured by reranking constraints in the tableaux which allows us to see what the learners' progress looks like in a phonologically formalized way.

As far as the above-mentioned hypotheses are concerned, the aim of this dissertation is to check how the status of a complete beginner's phonology is represented in OT, how certain constraints must be downgraded or promoted (reranked) in order for the speaker to produce phonemes of quality adequate for his level of advancement. Finally, one of the aims is also to investigate how the interim stages of interlanguage phonology for the analyzed speakers can be represented in OT. This study has also one "side-aim" which is to see which structures, of those under our analysis, can be regarded as marked. We will check Jakobson's assumptions pertaining to language acquisition against our speakers in the light of markedness in second language learning in order to see if they bear any relation to coda obstruent devoicing in the two languages and what form will turn up as the marked ones.

This study comprises a number of chapters. It starts with an overview of the major second language acquisition developments over the years in order to show how Optimality Theory draws on the Universal Grammar. OT is properly introduced and discussed in the third chapter where concise description of the workings of the theory is provided along with an explanation what second language acquisition is in OT. The chapter ends with a discussion of the concept of markedness and the constraints related to it. In chapter 4 we focus on the Polish language itself. We try to investigate how final devoicing can be formally presented in 3 approaches: rule-based, government phonology and optimality-theoretic one and consequently we justify the choice of OT as a framework for this study that we choose. Chapter 5 discusses the research methodology and talks about how the data sets have been collected and what point of reference is chosen for analyzing them. The chapter that follows is a proper analysis of the speakers' performance. Each subchapter there is devoted to one speaker and both devoicing and voice adjustment are commented on individually. That chapter also comprises a summary of datasets which are mainly concerned with the markedness as well as rankings among all participants. Finally, the discussion started in chapter 6 is continued in chapter 7 where, in addition, it is given some final conclusions and suggestions for a further research. The appendices with all the speakers' realizations are to be found at the end of the dissertation.

Chapter 2: An overview of the development of SLA

Over the last few decades various developments concerning the theory of linguistics have been reflected in the studies of second language acquisition, often referred to as SLA. This branch of applied linguistics has been investigating how people learn another language once they have learnt their mother-tongue. SLA looks at why certain structures in a given foreign language are more difficult to acquire than others. Moreover, not only does it look into the ways in which speakers "attain proficiency in a language which is not their mother tongue", but also it has been trying to answer questions such as: how are foreign languages learnt in general, how to improve the ways of teaching foreign languages, and finally, what do learners transfer from their native language into the new language they are acquiring (Archibald 1998: 1-2).

The rudiments of a pre-SLA framework were first provided by scholars such as Fries (1945) and Lado (1957). They approached the second language acquisition from the perspective of the Contrastive Analysis. As the name itself implies, the emphasis was placed on an study of the contrasts between native languages (L1s) and the target languages (TLs or L2s). To summarize the approach of those times, it is worth quoting Lado (1957: vii, 1-2), who wrote, "Those elements that are similar to [the learner's] native language will be simple for him and those elements that are different will be difficult". Last but not least, it is perhaps important to mention Archibald (*ibid.*), who concludes that the 1950s and 60s is the time when pedagogy is the primary objective. As far as some examples of the acquisition of L2 phonology within this concept are concerned, one could quote a vast number of different experiments investigating, e.g. how Francophones acquire English sounds, both similar and different to their L1 segments which was reported by LaCharite and Prevost (1999). Last but not least, the above theory of SLA is well summarized in terms of phonology by Brown (1997, 2000) who writes that segments which present difficulty in acquisition are precisely those whose representations require features that are not supplied by L1.

The next developmental stage of SLA was in large measure based on Chomsky's competence vs. performance differentiation. Corder (1967) claimed that it is learners' errors that allow us to look into their linguistic knowledge. He found errors to be very

helpful indicators of the stages of development of language in a given learner. In addition, Corder maintained that errors do not result from bad habits and they should be grouped according to various typological classes. Since investigating mistakes indeed allowed an analysis of productive skills, i.e. writing and speaking (including the acquisition of phonology that is crucial for this paper), it could not look into the receptive skills (listening and reading) and had to be significantly neglected for the concept of the interlanguage that was a more comprehensive, and yet a third approach to SLA.

Selinker (1972: 214) provides the following description of learner grammars, "[they are] a separate linguistic system based an the observable output which results from a learner's attempted production of a TL norm". In other words, he asserted that each learner has his or her own grammar which is governed in accordance with a set of its own rules. Selinker, then came up with the notion of 'interlanguage', which as Archibald (1998: 5) describes it "is influenced by both L1 and L2, though the proportion of influence is dependent on the learner's level of overall proficiency". Major's (1987) Ontogeny Model of second language acquisition seems to be very efficient at depicting how the number of transfer errors (i.e. these errors mirroring the transfer from L1) is inversely proportional to the time elapsing. Hence, there should be a drop in the quantity of errors as we progress in the process of L2 acquisition.

Ever since Selinker defined the concept of 'interlanguage", there has been a departure from a more pedagogy-oriented research which had been exploring language teaching, in favour of a generative movement. An assumption that humans have innate access of Universal Grammar (UG) (Chomsky 1965, 1986) when acquiring L1 has been largely accepted. Nevertheless, the acquisition of L2 within this framework has been slightly controversial. Clahsen and Muysken (1986) claim that there is no access to UG for adult second language learners. Strozer (1992), on the other hand asserts that L2 learners do indeed have access to UG, but it is only partial and absolutely not the same as for L1 acquisition. There is a third view, where e.g. Schwartz and Sprouse (1996) maintain that L2 learners have a full and direct access to UG which, all in all, makes L1 and L2 acquisition very similar. Nevertheless, there seems to be a lack of language transfer within this theory. The solution to that could perhaps be introducing the spin-off of the generative grammar in the form of Optimality Theory (OT) (Prince and Smolensky

1993, McCarthy and Prince 1993), where the transfer could take the form of moving the rankings of the universal constraints ordered in a language-specific way. If we look at it from the perspective of UG, this would indicate that Universal Grammar gives as an access to a default ranking of constraints that we need to reorder in terms of importance depending on the language we are speaking at the given moment. Broselow and Xu (2004: 136) summarize OT by saying that "Optimality Theory provides not only a model of possible grammars, but also a model of how these grammars can be learned. The set of constraints is presumed to be universal, but the rankings specific to individual languages are learned from the data available to the learner".

Chapter 3: Optimality Theory (OT) – introduction

3.1 The basics of OT

This dissertation is organized around the latest framework operative in phonology these days –Optimality Theory (henceforth OT). Should one want to summarize the whole idea of the theory, one could perhaps say that it helps with finding the optimal candidate that would give the best possible input to the phonetics of an individual. However, it is crucial to see how innovative this framework is when compared to its most prominent predecessors.

Before the concept of OT was introduced and acclaimed as non-derivational phonology, we had been confronted with its derivational counterpart - the rule-based theory. This approach has been dubbed the so-called "SPE-tradition", a name deriving from the groundbreaking book by Chomsky and Halle (1968) where a wide-ranging view of English phonology was presented. Chomsky and Halle showed how underlying representations (in other words the shapes of morphemes) can be mapped onto the surface representations (the input to the phonetics) by applying a set of ordered rewrite rules (derivations). For this reason, SPE provided an unlimited opportunity of writing many rules that would allow to yield a given phonetic shape of a word. It was executed by rules being applied one after another and the output of one rule was the input for the next rule (Kager 1999: 1). An instantiation of a rule could take the following form: A→B/ X_Y. A rule to be read as: *A changes into (or is rewritten as) B in the context between X and Y.*

Optimality Theory, on the other hand, is a constraint-based mapping. The major sources for the theory are Prince and Smolensky (1993/2002) and McCarthy and Prince (1993). The concept of OT aims at explaining a wide scope of various phonological alternations in possibly the most straightforward fashion. The structure of Optimality-theoretic grammar is very concisely described by Prince and Smolensky (2002: 4-5):

> The grammar must define a pairing of underlying and surface forms, ($input_i$, $output_j$). Each input is associated with a candidate set of possible analyses by the function Gen (short for 'generator'), a fixed part of Universal Grammar. In the rich representational system (…), an

> output form retains its input as a subrepresentation, so that departures from faithfulness may be detected by scrutiny of output forms alone. A candidate is an input-output pair (…). Gen contains information about the representational primitives and their universally irrevocable relations: for example, that the node σ may dominate a node *Onset* or a node μ (implementing some theory of syllable structure), but never *vice versa*. Gen will also determine such matters as [e.g.] whether every segment must be syllabified.

Before going on to describing an example process of selecting the optimal (winning) candidate, it would be worth depicting the mechanics of OT with a specimen tableau that is used most dominantly to show the rankings of constraints and how a required output is singled out from a wide selection of various outputs. Let us use Hammond (2003: 13-14) as the base for a very concise, though simplistic, overview of the constraint table, most often referred to as a tableau.

	/input/	$Constraint_1$	$Constraint_2$
☞	$Output_1$		*
	$Output_2$	*!	

The pairing of underlying and surface forms, mentioned above, is to be found to the left of the tableau. The *input* being the underlying form of the morpheme is always given in the slashes // in the upper left corner. The surface forms, i.e. different possible $outputs_{1,2,...}$, are to be found below the input, again to the left of the table. The constraints that are relevant for the analysis are given in the headings of the remaining columns (*$Constraint_1$ $Constraint_2$*) and are generated by 'Gen'. An asterisk (*) is used to indicate a constraint violation, an exclamation mark shows a crucial violation whereas the pointing finger/hand indicates the winning candidate.

Prince and Smolensky (1993) have conducted a number of analyses within OT. This has given us a broad picture of what the process of selecting the optimal candidate should look like. First of all, it takes place in one step – this is a single pairing of an input and the output which has to pass through a constraint. According to Stemberger and Bernhardt (1997: 2) a constraint is "a limit on what constitutes a possible pronunciation of a word" whereas Kager (1999: 9) defines it as "a structural requirement that may be either satisfied or violated by an output form". For each underlying representation 'Gen'

can generate an infinite number of output candidates (in our table this is indicated by $Output_{1,2,...}$). These candidates are then evaluated by a choice of output constraints. Not all the constraints need to be satisfied. Therefore, we say that constraints tend to make conflicting requirements on the surface forms. It has to be borne in mind, however, that although the constraints are indeed violable, we would expect the winning (optimal) candidate to violate a minimal number of constraints, necessarily most low-ranked (i.e. this one which is placed to the right side of the chart). As for the ranking, every single language grammar is assigned with a strict ranking of constraints that is typical of that given language. Moreover, languages do not differ in what constraints build their grammars but rather they have their own and specific rankings of these constraints. In other words, constraints will be universal for all languages of the world and it is only their hierarchy that has to be reranked which, all in all, tells them apart. This is concluded by Prince and Smolensky (1993: 6) who say, "The constraints provided by Universal Grammar are simple and general; interlinguistic differences arise from the permutations of constraint-ranking".

The Optimality Theory has at its disposal a wide selection of constraints and it is impossible to list all of them at a time. In general, they can be grouped into a number of categories (Kager 1999):

- positive — e.g. ONSET (syllables must have onsets)
- negative — e.g. *ONSET (syllables must not have onsets)
- alignments — e.g. Morph-syll (align a morpheme to a syllable)
- faithfulness — e.g. I-O (input must have corresponding elements in the output)
  - DEP (dependency – output must depend on the input – no adding)
  - MAX (maximality –keep the output to the maximum – no deletion)
  - IDENT (do not change the output against the input)
- markedness — e.g. *VOICEDCODA[1]

The said constraints can then be made more specific or limited. We can do this by adding some information on what a given constraint should apply to. For instance, if we intend to keep only labial phonemes identical in an input-output pairing, we can indicate

[1] The relationship between faithfulness constraints and markedness constraints is discussed in chapter 3.3.

this by writing $IDENT_{[LABIAL]}$. The same may pertain to other constraints as shown by the $*COMPLEX_{OBS\text{-}OBS}$ in the table below.

Having introduced the concept of constraints it seems crucial now to show a small and specimen analysis to briefly illustrate the working of OT. Let us take the word *psychology* as our input:

	/psaɪkɒləʤi/	$*COMPLEX_{OBS\text{-}OBS}$	IDENT
☞	saɪkɒləʤi		*
	psaɪkɒləʤi	*!	

First and foremost, one has to make sure what language is dealt with in this analysis as this will determine the ranking of constraints. Since the word *psychology* is pronounced with the word initial obstruent-obstruent cluster /ps-/ in many languages such as German, Dutch, Polish etc. it can be inferred that IDENT will there have a priority over the avoidance of word-initial complex clusters such as /ps-/. Nevertheless, in English the situation is absolutely opposite. In this language it is more important not to pronounce /ps-/ as a word-initial cluster than to accept the form in the full as it is provided by the underlying form. Therefore, the ranking of this set of constraints for English in this case is $*COMPLEX_{OBS\text{-}OBS}$ >> IDENT whose meaning is $*COMPLEX_{OBS\text{-}OBS}$ outranks (i.e. is more important to maintain) than IDENT. It should be mentioned that a similar analysis for a language like German or Polish would be based on a ranking where $*COMPLEX_{OBS\text{-}OBS}$ would have to be demoted so that IDENT>>$*COMPLEX_{OBS\text{-}OBS}$. Only then could one yield the actual optimal output for those languages where /ps-/ would surface as the word-initial cluster.

3.2 Second language acquisition in OT

OT has not been seen in the linguistic limelight as far as second language acquisition is concerned. Although this theory currently seems to be of much interest to many linguists, a special attention should be paid to the researchers in the acquisitional studies who have found the concept of optimality particularly intriguing (Hancin-Bhatt 2000: 202-203). Hancin-Bhatt then claims that “OT has received little attention in the field of

L2 acquisition" whereas "in analyses of native phonologies, loan-word phonologies and L1 phonological acquisition" it has been used much more extensively. She also indicates the small number of OT studies on SLA that can be found in the literature to date (these include e.g. Hancin-Bhatt 1997 or Broselow et al. 1998). However rare the existing investigations are, they appear to be quite successful at explaining various second language phenomena with the use of Optimality Theory that, all in all, could not be explained previously when employing the earlier theories. This view is again held by Hancin-Bhatt (2000: 202-203) who exemplifies the superiority of OT over other theories by referring to some studies which have been able to explain "not only accuracy/error rates, but also error types in syllable structure, as well as learners' asymmetric behaviour with complex onsets versus complex codas".

The view of what exactly SLA is within the framework of OT is shared by a number of researchers. First of all, Hancin-Bhatt (*ibid.*) poses a question "how stages of interlanguage grammar development can be defined via a simple mechanism of constraint re-ranking in OT". A similar conclusion about the rerankings in OT is drawn by Monahan (2001: 17) who writes:

> The reranking of constraints is responsible for differences in the phonology of the interlanguage from both the native and target language, and as the learner continues to learn the target language, the constraints continue to be reranked, moving closer to the ranking of the target language.

His view of what L2 acquisition is in OT is very much confirmed by Hayes (2000: 3) who says:

> In the OT framework (…) the initial state in L2 acquisition is a full instantiation of the native language constraint hierarchy (full transfer). Subsequent L2 inputs feed a language learning mechanism which in turn inspires the IL grammar to restructure in order to conform to the L2 input, and the restructuring is guided by UG (full access).

Hayes (*ibid.*: 6) also quotes Tesar and Smolensky (1996) who have defined language acquisition in OT as "a process of reranking an initial constraint hierarchy to match the hierarchy of the target language". This is very much in accordance with the assumptions of Broselow et al. (1998: 269) who have accepted a model where,

"as the learner becomes more proficient, an interlanguage grammar will develop in which the rankings of constraints more closely approximate the target-language ranking". Last but not least, it is indispensable to quote Eckman (2004: 542) who makes a final remark on the rerankings within L2 acquisition. On the basis of the outcome of Hancin-Bhatt's (2000) study he concludes that "constraints reorder themselves in a systematic and predictable way".

If we now make a stipulation that the above is valid for the acquisition of the second language phonology we could hypothesise the following:

- an elementary learner is bound to map his L1 constraint hierarchy onto the production of L2 phonology

- as the command of the foreign language progresses and as the person becomes even a more advanced language user the order of constraints should be reranked so that the final aim is a rejection of L1 constraints' hierarchy employed for L2 and this should be done for the sake of accepting the L2 constraints' hierarchy for the production of L2 phonology

- there might also be some indications of the interim interlanguage stages which will result from the movements of the relevant constraints either up or down the ranking. The various ways of promoting and/or demoting the constraints might have a reflection in the phonology of the foreign language as it is used by learners at various proficiency levels.

The above-mentioned is confirmed by Hancin-Bhatt (2000: 205-206) who maintains that in the early stages of language acquisition the rankings tend to be unstable whereas the grammar dynamic. However, with the time passing by and the learner being exposed to some extensive input of the target language, there is stabilisation of constraint rankings. Finally, Hancin-Bhatt (2000) and Broselow et al. (1998) have observed that one may talk about various types of rankings which, in a way, fight against each other, as the grammar develops. Therefore, the interlanguage grammar might, according to Hancin-Bhatt (2000: 205-206), consist of the following sets of constraints:

> 1) the native language ranking, which account for 'erroneous' productions due to full transfer;
> 2) a hypothesized target language ranking, which accounts for accurate productions; as well as
> 3) re-rankings between the native and target rankings, which account for 'erroneous' productions that do not have an obvious link to the native or target grammar (see Broselow *et al*., 1998)

The above sets of constraints will, most certainly, allow us to characterize how the interlanguage develops and what is produced at given stages. Nevertheless, the differentiation of constraints as presented earlier is not sufficient for analyzing SLA, even when one considers the choice of rankings just quoted. Apparently, when discussing second language acquisition within the framework of OT, one needs to make a special reference to a concept known as 'markedness' and thus the so-called 'markedness constraints'. Broselow et al. claim that "[Learners' errors] tend to be towards unmarked structures". Therefore, one could presume that an extensive investigation of various aspects of errors is only possible once the concept of 'markedness' has been presented.

3.3 Markedness and markedness constraints

Markedness is a linguistic concept that has been acknowledged in various linguistic backgrounds such as Prague School's work (e.g. Trubetzkoy 1939/1969, Jakobson 1941), Natural Phonology (e.g. Stampe 1972), Underspecification Theory (e.g. Kiparsky 1982) and finally OT (e.g. Prince and Smolensky 1993). The notion, however, was first proposed by Trubetzkoy (1939/1969) and it has been applied to various areas within linguistics, including phonology. Trubetzkoy wanted to identify some relations between sounds in a language and his main assumption was that when one takes a pair of sound oppositions, one element in the pair would bear a mark which the other would lack. Over sixty years later the concept itself is still being discussed without being given a fully-fledged and clear-cut definition. For instance, Hume (2003: 295) maintains that "[Markedness] has essentially become a cover-term for properties such as natural/unnatural, frequent/infrequent, common/uncommon, easy to pronounce/hard to pronounce, acquired earlier/acquired later, etc.". Rice (2007: 80-81), on the other hand, summarizes the notion by saying that "markedness is used in

phonology to capture the central observation that not all elements in a phonological system are of equal status". She then gives a number of terms that are often used to show the difference between the marked and unmarked elements. As far as criteria are concerned, she seems to be building mainly on the works of Trubetzkoy (1939/1969) and Jakobson (1941) and gives a list of possible contrasts. Some non-phonological examples (possibly important for this analysis) include the following:

marked	**unmarked**
less natural	more natural
more complex	less complex
later in acquisition	earlier in acquisition
harder to articulate	easier to articulate
perceptually more salient	perceptually less salient

As for the phonological criteria she exemplifies the following features:

marked	**unmarked**
subject to neutralization	result of neutralization
unlikely to be epenthetic	likely to be epenthetic
trigger of assimilation	target of assimilation
remains in coalescence	lost in coalescence
retained in deletion	lost in deletion

DeLacy (2006: 5) holds a view that one cannot say that a given segment is ever 'not marked'. Nevertheless, we can use the term for comparisons and determine when an element is less (or more) marked than another element. He also claims that there can be a lot of markedness hierarchies and they can cover the areas of e.g. voice, sonority and tone. DeLacy (*ibid.*: 34) also notices that among the phonological literature people have agreed that there are, indeed, markedness hierarchies and as an example he quotes an "almost universal agreement that the obstruent voicing hierarchy has voiced obstruents as more marked than voiceless ones" (This is also confirmed by Rice 2007: 81). This proposition will be of great importance here in the subsequent chapters, when a proper analysis of final devoicing will be conducted.

Markedness also has its well-deserved place in the framework of Optimality Theory where it tends to play a crucial role in determining the optimal candidates for various types of analyses. Previously we have seen one of the possible divisions of constraints into their various types with respect to whether they allow or disallow a given feature or if they demand the output to be identical to the input etc. However, all these kinds of constraints may be recapitulated by employing a much simpler split. As Kager (1999: 4-5) writes:

> Two forces are engaged in a fundamental conflict in every grammar. The first is MARKEDNESS, which we use here as a general denominator for the grammatical factors that exert pressure toward *unmarked types of structure.* This force is counterbalanced by FAITHFULLNESS, understood here as the combined grammatical factors *preserving lexical contrast.*

The above can now be translated into the actual types of constraints and their examples. Kager (1999: 9-10) gives them as follows:

Examples of markedness constraints

a. Vowels must not be nasal
b. Syllables must not have codas
c. Obstruents must not be voiced in coda position
d. Sonorants must be voiced
e. Syllables must have onsets
f. Obstruents must be voiced after nasals

Examples of faithfulness constraints:

a. The output must preserve all segments present in the input
b. The output must preserve the linear order of segments in the input
c. Output segments must have counterparts in the input
d. Output segments and input segments must share values for [voice]

One can expect that markedness and faithfulness will be in a conflicting relation to each other. Kager (*ibid.*) claims that should there be a hypothetical language with no markedness restrictions, we would end up with it having by far too many lexical contrasts. By contrast, if a language gave possibly maximal priority to markedness, only a tiny lexicon would be yielded. Consequently, we should expect that markedness and

faithfulness, although they compete, cannot work without each other. Markedness constraints could alter the shape of a lexical item too much, but this is withheld by faithfulness constraints which play the role of a protector of the lexical shape. Certainly, there are situations in various languages when one of the types is bound to win. Kager's standpoint is that (1999: 29)

> When markedness dominates faithfulness, the language achieves outputs that are minimally marked, at the expense of a neutralization of lexical contrasts. But when faithfulness dominates markedness, the language makes the reverse choice, realizing its input contrasts at the expense of output markedness:
>
> a) Markedness >> Faithfulness lexical contrasts are neutralized
>
> b) Faithfulness >> Markedness lexical contrasts are expressed

If we take this assumption and refer it to the production of final obstruents in English and Dutch we can see the following. In English *bet [bet]* and *bed [bed]* will be differentiated on the grounds of FAITH>>*VOICEDcoda. This means that the faithfulness constraint will be more important to be satisfied than the markedness constraint (no voiced coda) and as a result lexical contrast will be expressed. However, should we take the same lexical items in Dutch where the ranking of the two constraints is inverse, we yield *bet* [bet] and *bed* [bet] being the same phonetic realizations of two different words. This, as a consequence, shows that the lexical contrast is neutralised. The tableaux for the word *bed* will look as follows:

Dutch	/bed/	*VOICEDcoda	FAITH
☞	[bet]		*
	[bed]	*!	

English	/bed/	FAITH	*VOICEDcoda
	[bet]	*!	
☞	[bed]		*

There are more languages like Dutch, where *VOICEDcoda >> FAITH. Polish is one of them and so one can expect that within this language lexical contrasts will also be neutralized for the sake of satisfying various markedness constraints. Since voiced obstruents are phonetically more complex to produce (Piñeros 2002: 9-10) and involve "additional muscular effort in order to get the vocal fold to vibrate" (as opposed to e.g. the production of sonorants where "vibration comes rather effortlessly"), we could presume that voiced obstruents can be called marked sounds. This neatly closes the discussion of markedness for the time being and allows us to conclude that languages like Polish and Dutch are bound to aim at unmarked structures in terms of coda voice.

Chapter 4: Final devoicing in Polish

4.l Towards a rule-based approach

Polish, as opposed to English, is one of the many languages of the world where all word-final obstruents lose their voicing in a pre-pausal position. The issue has been quite widely investigated, in a number of aspects, for languages such as: Catalan, Dutch, German, Russian, Afrikaans, Turkish and Polish where the word-final obstruents tend to be devoiced (cf. Oostendorp 2006, Dinnsen and Charles-Luce 1984, Wheeler 2005, Slowiaczek and Dinnsen 1985, Slowiaczek and Szymanska 1989, Wilson 2003, Ernestus 2000, Gussmann 2002, Grijzenhout 2000). As far as Polish is concerned, the following selection of examples presents a few good cases where the process of final devoicing can be observed. The examples (in nominative singular) have been provided with their alternations to show the underlying [+voice] obstruent and are given in their orthographic form with only the relevant phonemes indicated:

a. klu[p] ‘club’ klu[b]u *gen. sg*
b. płu[k] ‘plough’ płu[g]i *nom. pl.*
c. ga[t] ‘reptile’ ga[d]y *nom. pl*.
d. nó[ʃ] ‘knife’ no[ʒ]y *gen. pl.*
e. mó[sk] ‘brain’ mó[zg]om *dat. pl.*
f. łó[tɕ] ‘boat’ ło[dʑ]iami *inst. pl*

The discernible pattern is that word-finally every [+voice] obstruent will lose its voicing in favour of its [-voice] counterpart. Consequently, what is a phoneme [d] underlyingly will surface as [t] whereas [g] as [k], [dʑ] as [tɕ], [z] as [s] etc.

Under the circumstances described above, all word-final obstruents will lose their [+voice] feature. This according to Slowiaczek and Dinnsen’s claim (1985: 326) will be a typical situation “when obstruent voicing is non-constrastive in word-final position”. This is finely attested in Polish where final devoicing may lead to a situation where homophones are produced. Since, for example, *bóg ‘Bóg’* (having an underlying

[+voice] [g]) will be pronounced with a word-final [k] which is the devoiced counterpart of [g], it will sound unrecognizably similar to *buk 'beech'* with an original, underlying, voiceless [k]. This can be extended to quite a number of other items of the Polish lexicon and some examples of Polish homophones can be found below:

a. bóg 'god'	buk 'beech' *nom.sing*.
b. choć 'although'	chodź 'come' *imperat.*
c. jesz 'you eat'	jeż 'hedgehog' *nom.sing.*
d. kred 'chalk' *pl.gen.*	kret 'mole' *nom.sing.*
e. wiec 'rally' *nom.sing* .	wiedz 'know' *imp.2nd p.sing*

As far as the non-contrastiveness is concerned, Wisniewski (2007: 151-152) holds a view that word-finally (again in a pre-pausal position), there is no voicing contrast and thus the [+voice] vs. [-voice] opposition is neutralized i.e. the features are no longer distinctive for this particular situation. Nevertheless, his claim is refuted by Slowiaczek and Dinnsen (1985) who conducted an experiment in which they proved that the phenomenon of devoicing has a non-neutralizing status in Polish. This is due to the fact that vowel duration is different before final obstruents that were and were not underlyingly voiceless.

However important the neutralization is here, we are by far more interested in the approach to the devoicing itself. In the account of their research (*ibid.*: 327) Slowiaczek and Dinnsen seem to be employing a rule-based approach for their analysis and write:

> The rule of word-final devoicing (…) converts underlying voiced obstruents into phonetically voiceless obstruents and accounts for the absence of a voice contrast word-finally. The rule can be formulated as follows: [-sonorant] → [-voice] / _#

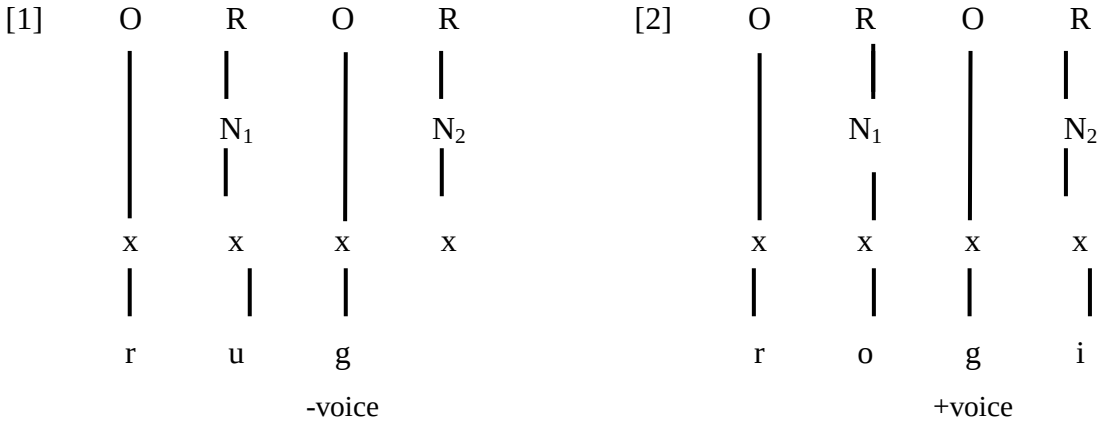
First and foremost, this rule allows us to account for the derivation of word-final devoiced obstruents which were [+voice] underlyingly. On the other hand, it may imply that we need two separate derivations for obstruents that are underlying [+voice] and [-voice]. Slowiaczek and Dinnsen (*ibid.*) differentiate that as follows: "some word-final obstruents are derived from underlying voiced obstruents by the rule of word-final

devoicing, and others are derived from underlying voiceless obstruents". This explanation seems to be slightly over-simplistic and does not really go deeply into the actual phonological reasons for the sound alternation. To conclude, the rule-based approach does not actually clarify why devoicing happens at all and it should perhaps be complemented by other phonological theories.

4.2 A government phonology approach

Government phonology is considerably more efficient at explaining the phenomenon of final obstruent devoicing in Polish than the rule-based approach. Not only does it demonstrate the actual final product of devoicing but it also allows us to see on what grounds the new segment is yielded. It should be mentioned that, as previously, the same selection of examples along with their alternations will be adopted here for the sake of showing how this phonological theory is implemented.

Harris (1994: 210) provides the following definition of final devoicing, "Devoicing consists in the suppression of the slack-vocal-cords element, an event that reflects the diminished autosegmental licensing power of a domain-final empty nucleus". His approach seems to be taken on board by Gussmann (2002 and 2007) who gives a thorough account of voice and voice-related phenomena based on German and Polish respectively. Gussmann (2002: 147) claims that, "the word-final position is only superficially final" and that within a word the final consonant is nowhere else but in the onset (O) and may or may not be licensed by a following nucleus depending on whether it contains some melody or not. In both Polish and German we are often confronted with the so-called *empty nucleus*. This happens when an obstruent is not given any tone specification by the virtue of the absence of a nucleus that would follow. As a result the normally voiced obstruent is not licensed by the nucleus and so is pronounced as voiceless. As Gussmann puts it (2007: 290) "word-final suppression of voicing in obstruents is due to weak licensing potential of domain-final empty nuclei". Let us now see how this can be illustrated:



Let us assume that each of these two words constitutes a uniform domain. The first representation [1] shows the syllable structure of a Polish word *róg* (*corner* sing.nom.). As shown above, the word-final, underlyingly [+voice] velar stop [g] is marked as [-voice]. This is due to the fact that being an empty nucleus (N), N_2 is not capable of supporting or licensing the voice of the preceding consonant. As opposed to that, we are given an alternation of the word *róg* being *rogi* (*corners* pl.nom). In this example, N_2 is now able to license the preceding obstruent as it is assigned a vowel and thereby it is pronounced as [+voice]. This quite distinctly backs up the definition given by Gussmann (2002: 149) where he writes, "Devoicing is (…) the failure of the voice property to be licensed by a domain-final empty nucleus".

Obviously, the above description of this phonological process could be extended to a much bigger number of examples. However, for the time being it seems sufficient to present the very basic working of the two approaches. Since this paper focuses on the optimality-theoretic framework, we shall focus more on this particular assumption and analyse the word-final devoicing by employing a system of constraints.

4.3 Optimality-theoretic approach

The relation of OT to the analysis of final devoicing is significant due to the presence of markedness constraints. It is them that will evaluate the output candidates and, above all, check if the possible output representations are built in a way that is sought-after in a particular language. OT gives a vast opportunity to investigate (de)voicing of obstruents in the word-final position and at the same time one may introduce a number

of various sets of constraints that enable optimal candidates to be yielded irrespective of the other (perhaps distracting) candidates.

As far as final devoicing in the absolute final position is concerned Fery (1999: 1-2) describes two approaches to it that have been so far proposed in the literature. The first one is known as *onset-based approach* and is formulated by Lombardi (1991, 1995). The second one, on the other hand, is called *the neutralizing coda-based approach* and is advocated by Rubach (1989), Vennemann (1972) and others.

4.3.1 Positional onset-based approach

Let us see how the positional onset-based approach works for the devoicing in Polish. Beckmann (1997, 1998) proposes that faithfulness, rather than being an overall single constraint, should be decomposed into a number of constraints which would pertain to a given position of a segment within a syllable. Therefore, when talking about final devoicing it is bound to be more important to require the onset to stay with the same [+/- voice] feature. On the contrary to that is the coda position where e.g. obstruent voice contrast is not significant in many languages. Let us now see how this works for Polish word-final devoicing[2].

We first need to introduce a number of constraints: a more general one being IDENT(voice) which means that corresponding segments must not differ in their voicing; and some more specific ones: $\text{IDENT(voice)}_{\text{Onset}}$ – corresponding onset segments must not differ in their voicing, *VOICEDOBSTR – obstruents are always voiceless, NOCODA – syllables have no coda. We shall now see how the following ranking of constraints inferred from the study by Fery (1999:3) works for Polish. We will be using two words and their respective plurals (all nominatives) to check this: *chleb* [xlɛp] (bread) and *chleby* [xlɛbɨ] (breads) as well as *drozd* [drɔst] (thrush) and *drozdy* [drɔzdɨ] (thrushes). The first set of course with a single word-final obstruent and its alternation while the second one with an obstruent cluster along with its alternation.

[2] An analysis of German conducted by Fery (1999) is used here as the basis for the analysis of Polish.

Let us accept the following ranking:

IDENT(voice)$_{Onset}$>>*VOICEDOBSTR>> IDENT(voice)>> NOCODA

We assume that the underlying representation of /xlɛp/ is /xlɛb/. That is owing to the fact that the word has various alternations with a surfacing obstruent [b] e.g. chle[b]y (pl.nom.), chle[b]owy (adj.), chle[b]ek (dim.) and only when word-final the segment [b] surfaces as [-voice]. The syllables boundaries are marked with dots e.g. .CVC.

The tableau for the singular nominative *chleb* looks as follows:

	/xlɛb/	IDENT(voice)$_{Onset}$	*VOICEDOBSTR	IDENT(voice)	NOCODA
☞	.xlɛp.			*	*
	.xlɛb.		*!		*

Whereas the same set of constraints works for the plural of *chleb* in the following way:

	/xlɛ.bɨ/	IDENT(voice)$_{Onset}$	*VOICEDOBSTR	IDENT(voice)	NOCODA
	.xlɛ.pɨ.	*!		*	
☞	.xlɛ.bɨ.		*		

There are a number of important remarks to be made about the two tableaux above. First of all, we need to notice that there has been a resyllabification when plural is looked at from the perspective of the singular form. In the case of the singular, [p] / [b] are in the coda position while in the plural form they are resyllabified and assigned to the onset position. That can be the reason why [b] no longer is devoiced as this process cannot happen for the onset position. Moreover, it is worthwhile observing why certain candidates violate the given constraints. As for [xlɛp], it violates IDENT(voice) owing to the change of the [+voice] phoneme [b] into the [-voice] phoneme [p]. Also, the NOCODA constraint demands that the candidate has no coda which cannot be satisfied by [xlɛp]. The realization [xlɛb] loses in this analysis because it violates a higher-ranked constraint *VOICEDOBSTR which must be satisfied in order to have the final obstruent devoiced. Consequently, [xlɛp] is the winning optimal candidate. Nevertheless, the violations work slightly differently for the plural nominative. In this case [.xlɛ.pɨ.] can be immediately rejected as it violates the highest-ranked constraint

IDENT(voice)$_{Onset}$. Indeed, [.xlɛ.bɨ.] violates the *VOICEDOBSTR constraint, it is low-ranked enough for the candidate to become the winner.

The same ranking seems to be working perfectly well for a word-final obstruent cluster below. Again, having added the plural marker -ɨ we can see that in this case the consonants are resyllabified too. To sum up, one should say that to exclude the devoicing within the plural form, it is enough to have a high-ranked constraint IDENT(voice)$_{Onset}$ which is violated by candidates such as: .drɔ.stɨ. or .xlɛ.pɨ. In contrast to that, to yield the form with a devoiced final obstruent the constraint *VOICEDOBSTR will do the job by declining the candidate with the voiced word-final obstruent(s).

	/drɔ.zdɨ/	IDENT(voice)$_{Onset}$	*VOICEDOBSTR	IDENT(voice)	NOCODA
	.drɔ.stɨ.	*!*		**	
☞	.drɔ.zdɨ.		**		

	/drɔzd/	IDENT(voice)$_{Onset}$	*VOICEDOBSTR	IDENT(voice)	NOCODA
☞	.drɔst.			**	**
	.drɔzd.		*!*		**

4.3.2 Neutralizing coda-based approach

For the coda-based approach we need to build a tableau with two markedness and one faithfulness constraints (Fery 1999:3). As shown below, they work together similarly to the previous tableaux, although those ones had 2 faithfulness constraints and one markedness constraint. Moreover, it is worth mentioning that Fery (*ibid.*) observes that, "[o]ne constraint is a special case of the other, in the sense that the violations of the specific constraint form a subset of the violations of the general case". In other words, for instance the constraint IDENT(voice)$_{Onset}$ may be classified as the subset of a more general constraint IDENT(voice) etc.

For this approach we only need to bring in one new constraint, namely FINALDEVOICE which, if reformulated, can take the form of *VOICEDOBSTR$_{(CODA)}$ that, all in all, could

be treated as a subset of the constraint *VOICEDOBSTR. Let us, however, employ the name FINALDEVOICE which is better at recapitulating on its meaning.

	/xlɛb/	FINALDEVOICE	IDENT(voice)	*VOICEDOBSTR	NOCODA
	.xlɛb.	*!		*	*
☞	.xlɛp.		*		*

	/xlɛbɨ/	FINALDEVOICE	IDENT(voice)	*VOICEDOBSTR	NOCODA
☞	.xlɛ.bɨ.			*	
	.xlɛ.pɨ.		*!		

	/drɔzd/	FINALDEVOICE	IDENT(voice)	*VOICEDOBSTR	NOCODA
	.drɔzd.	*!*		**	**
☞	.drɔst.		**		**

	/drɔ.zdɨ/	FINALDEVOICE	IDENT(voice)	*VOICEDOBSTR	NOCODA
☞	.drɔ.zdɨ.			**	
	.drɔ.stɨ.		*!*		

To summarize the above analysis the following must be said. The constraint FINALDEVOICE is perhaps the only constraint to be satisfied when analysing the singular of a word with a final obstruent in a pre-pausal position. It can be surmised that violation of this constraint by candidates with word-final voiced obstruents will be absolutely sufficient to recognize the devoiced ones as the winners. However, when one comes to terms with the alternations in plural (e.g. *drozdy*, *chleby*) one needs to introduce a faithfulness constraint (IDENT) to yield the requisite optimal candidates as only then can we turn down a candidate with word-medial devoicing (such as .drɔ.stɨ. and .xlɛ.pɨ both of which do not satisfy IDENT(voice) which in the end becomes a fatal violation) .

Having looked at the examples provided here it may be valid to say that NOCODA constraint (although important for the analysis of German for example) does not play any role while investigating final obstruent devoicing in Polish. Furthermore, it appears

that both the coda and the onset approach are adequate and efficient at explaining the final devoicing. As a final and summarizing remark about the two approaches one could quote Fery (1999:4) who briefly writes that, "both contain the same amount of complexity in the formulation of the required constraints, since they use one constraint of one kind, either faithfulness or markedness, sandwiched between two constraints of the other kind". As a concluding remark, it should perhaps be remembered that one may find a few more OT approaches to the phenomenon of final devoicing (e.g. van Oostendorp 2006). Nevertheless, this work here will focus on the two hierarchies of rankings just presented as they seem to be working efficiently for the languages analysed here.

4.4 Voice adjustment

So far we have been presented with a multifaceted account of word-final devoicing in a pre-pausal position. However, it does not appear to be sufficient when discussing the change of the feature [+voice] into [-voice] for obstruents placed at the end of words. It can be claimed that another reason for word-final devoicing is as follows: when two words are juxtaposed, the voicing of the word-final obstruent of the first one may be influenced by the word-initial obstruent of the second one. It needs to be stressed that voice adjustment (henceforth VA) in Polish has a great number of aspects and environments to be discussed. Nevertheless, here a special emphasis will be placed only on this part of this phonological process that has a direct relevance to the loss of [+voice] feature at the end of words.

4.4.1 VA in Government Phonology

VA is claimed to be a phonological regularity (Gussmann 2007: 292-294) since it is valid in all positions: word-internally, in-between words etc. It must enunciated clearly that "[VA] is optional and serves as a clear marker of connected speech". Some examples of the process relevant for this analysis include the following:

[vruk Toma]	'Tom's enemy'
[vrug brata]	'borther's enemy'

[wɨʃka] ‘spoon’ *sing.nom.*

[wɨʒva] ‘skate’ *sing.nom*[3]

[musk patsjɛnta] ‘patient’s brain’

[muzg dɔktɔra] ‘doctor’s brain’[4]

As can be inferred from the examples just presented, there must be voice uniformity in Polish in the given situations. [5] To briefly justify the process from the point of view of Government Phonology, Gussmann (2007: 293) explains it in this way:

> The gist of the operation consists in the elimination of domain boundaries separating the words. Once the internal boundaries are removed, the final nucleus of the first member of the new formation is no longer domain-final but rather domain-internal. Thus [e.g.] *kosz borówek* ‘basket of berries’ (…) is transformed from [kɔʃØ$_1$] [bɔruvɛkØ$_2$] into [kɔʃØbɔruvɛkØ$_2$]: Ø$_1$ and Ø$_2$ are domain-final nuclei prior to the domain modification. Once the internal domain-boundaries are removed, Ø$_1$ is no longer domain-final and VA enforces voice uniformity, yielding [kɔʒ bɔruwɛk].

If we accept this justification of the process, the very general implication coming from it is that the voice uniformity is bound to work in two ways. If the word-final obstruent (that is [+voice] underlyingly) is followed by a [-voice] obstruent then both must agree in their status of voicing and thus the [+voice] one is devoiced. If, in contrast to that, a [+voice] obstruent immediately follows the [+voice] word-final one, then having to agree in voicing, they both preserve the feature [+voice]. [6]

[3] [wɨʃka] ‘łyżka’ and [wɨʒva] ‘łyżwa’ although not directly connected reveal traces of voice adjustment resulting from the [±voice] phoneme that follows.

[4] It needs to be stressed that in English one can hardly ever encounter VA. Therefore, we normally have clusters like –td- (basketball), -kd- (backdoor), -gʃ- (eggshell) as opposed to the Polish ones which need to agree in voicing.

[5] For Polish dialectal differences in voice assimilation see Wisniewski 2007

[6] For a much thorough discussion of VA in Polish see Gussmann 2007.

4.4.2 VA in Optimality Theory

The short description of the VA process given in the Government Phonology framework should be construed as a brief introduction to this phonological regularity in Polish. Nevertheless, as it is Optimality Theory that will be employed to analyze the data sets from the speakers, it is appropriate to look at how VA can be presented within this framework.

Let us look at the word boundaries in Polish using some new examples. [vruk publitʃnɨ] (*wróg publiczny* – public enemy) and [vrug brata] (*wróg brata* - brother's enemy). Even at the first glance, one can easily notice that the obstruents at the boundaries of two words agree in voicing (i.e. regressive assimilation where the following obstruent triggers the devoicing of the preceding one). This regularity can be demonstrated in OT in the following way: ([vrug] is the underlying representation)

	vru[g p]u.bli.tʃnɨ	AGREE	IDENTONSET(voice)	FAITH
	vru[g p]u.bli.tʃnɨ	*!		
☞	vru[k p]u.bli.tʃnɨ			*
	vru[g b]u.bli.tʃnɨ		*!	*

The ranking operative for the voice assimilation of obstruent-obstruent word-boundary in Polish is AGREE >> IDENTONSET(VOICE). These two constraints appear to be sufficient to help us choose the optimal candidate. Any possible realization with two consecutive obstruents must comply with the constraint AGREE whose meaning is *segments must agree in voicing regressively*. The other constraint which is outranked by AGREE is IDENTONSET(voice). The latter one's job is to assure that it is the second of the two obstruents that triggers the voice assimilation so that the process is regressive. This ranking seems to be yielding optimal (and desired) candidates of various sorts no matter what obstruent is taking part and if this is assimilation of [+voice] or [-voice] feature.

The following examples prove that[7]:

(*wróg brata* – borther's enemy)

	vru[g b]ra.ta	AGREE	IDENTONSET(voice)	FAITH
	vru[g p]ra.ta	*!		*
	vru[k p]ra.ta		*!	*
☞	vru[g b]ra.ta			

(*weź to* – take it)

	ve[ʑ̟ tɔ]	AGREE	IDENTONSET(voice)	FAITH
	ve[ʑ̟ tɔ]	*!		
☞	ve[ɕ tɔ]			*
	ve[ʑ̟ dɔ]		*!	*

(*zostaw go* – leave him)

	zɔsta[v gɔ]	AGREE	IDENTONSET(voice)	FAITH
☞	zɔsta[v gɔ]			
	zɔsta[f gɔ]	*!		*
	zɔsta[f kɔ]		*!	**

Obviously, one could come up with even more possible examples of this type of regressive assimilation. Moreover, examples could be equipped with a vowel-initial word that follows, a sonorant-initial word that follows etc. However, as this analysis is rather limited in its scope, a special emphasis will be put only on a list of selected aspects of devoicing and voice assimilation just presented. This, later on, should allow us to analyze the pronunciation of the Polish speakers of English and justify the "voicing mistakes" they make.

[7] It should be emphasized that only obstruents in the given word-boundary environment are being discussed here as it is believed that it may bear a significant relation to the production of English inter-word obstruent clusters in Polish speakers of English that will be analyzed in the subsequent chapters. For other types of assimilation see Gussmann 2007.

Chapter 5: The research methodology

5.1 Speech Data

As the research aims have already been determined (see chapter 3.2) the following analysis is going to check if our assumptions are valid for Polish speakers depending on their command of English. As mentioned earlier on, this dissertation intends to see how the rankings of constraints vary depending on the proficiency level of a given speaker with respect to final devoicing and voice adjustment.

Before collecting the data from various Polish speakers of English, one needs to establish a particular region to work on. This results from the fact that Poland can be divided into two separate areas with two distinct ways of dealing with voicing. We can distinguish the so-called Cracow-Poznan pronunciation and Warsaw pronunciation. With the former one, when the onset of the second word begins with a sonorant or a vowel then the word-final obstruent of the preceding (first) word is voiced, as opposed to the Northern pronunciation (the Warsaw one) where it is voiceless (Ostaszewska and Tambor 2000: 87-88). Due to, apparently, a clearer resemblance between English Received Pronunciation and the Warsaw pronunciation of Polish in terms of voicing, only Northern pronunciation Poles will be taken into account in this analysis.

Moreover, the other aspect which needs to be taken into consideration is determining the level of English with the Polish speakers. In order to find speakers whose command of English will vary considerably from one another, a placement test was employed. The test was ‘Quick Placement Test” by OUP (2002 version) and it was based on the ALTE levels (Association of Language Testers in Europe). which correspond to both the Council of Europe Levels as well as The Cambridge ESOL Examinations and IELTS tests. The participants were asked to complete a paper and pen test and had to answer 60 questions of various type, e.g. gap filling (a close test), multiple choice etc. Upon administering the test, the answers where checked with the use of the key provided in the test pack and the results obtained led to determining the proficiency level of the speakers. Overall, a group of 26 speakers took part in the language test. Out of the 25 people, 5 speakers were selected and every one was at a different level of

English. Therefore the shortlisted participants comprises 1 beginner, 1 elementary level speaker, 1 lower intermediate, 1 upper intermediate and 1 very advanced user of English (the latter will be called here a Proficient user as she scored 98%). All participants were adult students aged between 22 and 34 and they did not reveal any speech disorders. None of the informants has received any instructions in English phonetics (i.e. regular English phonetics classes) as they all attended regular English classes at state schools and private language courses. Moreover, no one admitted to participation in any forms of Direct Method teaching (e.g. Callan Method) which are reputed to have some special drilling ways of teaching clear word-final voicing. Upon selecting a group of final participants, it was now possible to see if the assumptions from the previous chapters are valid for these speakers. In order to achieve this aim, speech data had to be collected and later on analysed. Every participant was asked to read out naturally (without any special enunciation) a selection of various English words, expressions and short sentences (the list to be found in Appendix 1). Among the words to be read out, one could find not only target elements, i.e. environments with possible final obstruent devoicing or voice adjustment but also some distracting items, i.e. words and expressions not relevant for this analysis.

The recording took place between 1st and 10th June 2008, just several days after the placement test. The speech samples were recorded on Sony Hi-MD Blank Mini Discs with the use of a Mini Disc recorder SONY MZ-N710. The device was placed indoors and relatively close to the speakers' mouths with hardly any additional audible sounds coming in. It lay on a thick cotton cloth so that the amount of vibrations from the table was limited to the possible minimum. The recording unit was connected to a stand-alone microphone SONY ECM-DS70P which was connected to the recorder by means of a cord and then placed on the table between the recording device and the informant so that the speakers did not feel constrained by any new objects being attached to their clothes and at the same time did not directly feel/see the presence of the recording equipment. The recordings were then uploaded onto an ASUS PRO31F laptop through a USB cable (the laptop is equipped with an audio card SigmaTel Audio). As far as the quality of the recordings is concerned, it must be said that it was very good and allowed an accurate auditory analysis to be conducted. The auditory analysis itself was preformed in an impressionistic way on the same laptop by means of SONY MDR V150 headphones. Having listened to all the items necessary for

the research, they were transcribed with the use of the International Phonetic Association (IPA) alphabet as will be shown later on in the tableaux.

5.2 English norm as point of reference

A number of variables were identified. They are: realization of [+voice] word final obstruent as either [-voice] obstruent (devoiced) or [+voice] obstruent (the voicing is maintained) in a pre-pausal position and realization of [+voice] word final obstruent as either [+voice] obstruent when a word-initial [+voice] obstruent followed or as [-voice] when a [-voice] obstruent followed. The second variable was identified not only on word boundaries but also cross-morphemically as will be presented in the datasets later on in the analysis.

The variables which will be presented below may be treated as markers of the command of the foreign language. The more proficient a user becomes, the more native-like he or she sounds and thereby resembling Polish while performing in English should be minimised in the course of the process of learning a second language. Below one may find a concise summary of the literature that should be mentioned with reference to the variables within this research. It is necessary to have a point of reference for this analysis as one needs to establish an English norm that the learners should be aiming at while learning the second language.

In Received Pronunciation final [+voice] obstruents, e.g. as in *bed, bag, badge* etc. normally all end in a partially devoiced stop (marked in the following way: d̥, g̊ etc.) (Roach 2000: 34-35). This little voicing, as mentioned earlier, is of no significance for this study, as it deals with the vowel quantity which this research is not involved with. For this reason, standard English /d/, /g/, /ʤ/ and other [+voice] obstruents, although partially devoiced when word-final, will be construed as [+voice]. This is so only for one reason, namely, to make the difference between Polish fully devoiced word-final obstruents and English partially devoiced obstruents more discernible and easier to distinguish. Finally, in accordance to the above Sobkowiak (2004: 57) summarises the said devoicing in the following way, "[word-final voiced obstruents] remain closer to voiced than to voiceless in quality". As far as the voice adjustment in English RP is

concerned, there is one aspect to be commented on. It ought to be borne in mind that obstruent clusters in English can disagree in voicing (Sobkowiak 2004: 58), which, as was shown in previous chapters, is absolutely unacceptable in Polish. In other words, Polish will, for instance, comply with the regressive assimilation of voicing rules whereas English will not.

Chapter 6: Data analysis

6.1 Data sets and transcription

The data sets collected for this analysis will be organized in the following way. Each subchapter will deal with a separate speaker (or a pair of speakers). We will start with the data from Poles with the lowest level of English and in the course of the chapter will be going towards the highest level. The reason for that is very straightforward. Only then will we be able to see how (or if) the constraints are reranked to yield requisite optimal output candidates and also this will allow us to compare the rankings of various speakers with one another as we move between the data sets. As a result, we shall be able to see clearly what the process of second language phonology acquisition might look like in OT for these speakers (on the example of obstruent devoicing only).

Although, it has already been mentioned that in this work the phonetic alphabet of IPA will be employed, an extra remark needs to be made. Since most of the speakers below the level of upper-intermediate struggled with a fully correct pronunciation of certain items, it has been decided that the IPA alphabet will be used in tandem with the regular English orthography. This is due to the fact that perhaps we should not really care about the mispronunciations of e.g. vowels or diphthongs in the middle of the words as these may impede our analysis without being crucial for it at the same time. Moreover, when all the other elements (apart from those of our interest) will be made uniform and at the same time slightly disregarded, it may turn out that it will be possible to put a special emphasis on the phonemes which are the possible candidates for devoicing. That being so, the phonetic transcription will be provided in the square brackets [] beyond which regular alphabet letters are to be found. Finally, it needs to be mentioned that due to its ambiguous meaning the constraint *VOICEDOBSTRUENT will not be used below. We will substitute it with *VOICEDCODA which stands for 'no voiced obstruent codas are allowed'.

6.2 Data from a beginner level

The data which is meant to represent the beginner level of English was read by a female M.B, aged 34. She has never received any English lessons, nor was she exposed to the English language in any special way (e.g. living in the English-speaking country

etc.) therefore she can be acknowledged as a complete beginner. This judgement is also confirmed by her English placement test results.

6.2.1 Devoicing

As for her realizations of single words which end in an underlying [+voice] obstruent, she devoices most of the items. Therefore, we hear e[k], be[t], ro[p] etc. This can be illustrated in the tableaux in the following way:

As far as the positional onset-based approach is concerned we can yield her optimal candidates by employing the exact ranking of Polish which works as follows:[8]

	be[d]	IDENT(voice)$_{Onset}$	*VOICEDCODA	IDENT(voice)	NOCODA
	.be[d].		*!		*
☞	.be[t].			*	*

	san[d]	IDENT(voice)$_{Onset}$	*VOICEDCODA	IDENT(voice)	NOCODA
	.san[d].		*!		**
☞	.san[t].			*	**

With reference to the first tableaux (*bed)*, the first candidate .be[d]. brings about a fatal violation of *VOICEDCODA as it contravenes the requirement of codas not having any voiced obstruent. As for the second candidate with the coda phoneme /d/ being devoiced into /t/, it violates a low-ranked constraint IDENT(voice) which in these circumstances allows it to be the winning optimal candidate. The same commentary will be valid for the other lexeme (*san[d])*. Although it has two violations of NOCODA constraint, the constraint itself is ranked low enough for .san[t]. to win in this tableaux.

Similar violations will be valid for words such as *egg* realized as e[k], *Maz* as ma[s], *cheese* as chee[s] etc. However, there is a single item which receives some special voicing for its final obstruent, namely, *garage*, and it seems to have received a phoneme /ʒ/ for its coda. This might, nonetheless, be a case of an exception or just a coincidence and should not be construed as a regularity for retaining the voicing. As a result, it is left out here.

[8] Syllable boundaries are indicated by single dots .

One can obviously refer the same items to another approach employed for this analysis – the neutralizing coda-based one which also works perfectly well here and allows us to speculate that this is the ranking that might be used by this person to yield the given English outputs.

	ca[b]	FINALDEVOICE	IDENT(voice)	*VOICEDCODA	NOCODA
	ca[b]	*!		*	*
☞	ca[p]		*		*

	san[d]	FINALDEVOICE	IDENT(voice)	*VOICEDCODA	NOCODA
	san[d]	*!		*	*
☞	san[t]		*		*

This approach allows us to exclude non-optimal candidates relatively easily. Upon the application of FINALDEVOICE constraint one can rule out all candidates with a [+voice] word-final obstruent and hence ca[b] and san[d] are eliminated. As a matter of fact, this constraint may be found to be sufficient to yield the optimal realizations from M.B as none of the remaining constraints plays any significant role here.

As mentioned earlier on, the above items have been read out in separation. However, there was another task where other (but still similar) words had to be pronounced. Again, they all ended in an underlying [+voice] obstruent in a pre-pausal position but the words themselves were placed at the end of a naturally sounding sentence that the speaker might use in everyday conversations. The devoicing recurred here. All words such as *has, Raz, news, Bob* etc. have been said with a devoiced final obstruent, hence with the use of the rankings found above. Interestingly, there was again an exception which received considerably full voicing, i.e. in a sentence: *I want to buy a ba[ʤ]*. Nevertheless, as previously, this token cannot be treated as any form of a regularity, For the time being it should rather be something to be ignored on the grounds that full word-final voicing took place just twice for this speaker.

6.2.2 Voice adjustment

Referring back to chapter 4.4 and 5.2 one needs to bear in mind that in Polish two adjacent obstruents must agree in voicing when one of them is the first word's final

sound whereas the other is the initial sound of the word that follows. English is by far different in this respect and may lack voice assimilation which leads to voicing disagreement.

As for word/morpheme-final underlying [+voice] obstruent followed by a word/morpheme-initial [-voice] obstruent M.B devoices the former and as a result we have a cluster which agrees in voicing (they are all [-voice][-voice] clusters). As an interesting fact, it might be worth taking a look at the [-voice][+voice] clusters where one cannot observe any form of assimilation for this speaker and so the phonemes retain their underlying voicing. The tableaux for voice adjustment in this speaker will work in the following way:

For the words following each other in a sentence: (e.g. *I never go to a **bad club***) the first candidate violates the low-ranked constraint FAITH. The second one, on the other hand, is refuted on the grounds of a fatal violation of AGREE which is the top-priority constraint for voice assimilation. Finally, IDENTONSET(voice) is very efficient at excluding progressive assimilation here and by violating this constraint the third candidate [d.g] is ruled out too Consequently, in accordance with the dataset from M.B the first candidate is the optimal pronunciation for this speaker. The same commentary of violations is going to work for the remaining 3 tableaux.

	ba[d k]lub	AGREE	IDENTONSET(voice)	FAITH
☞	.ba[t.k]lub.			*
	.ba[d.k]lub.	*!		
	.ba[d.g]lub.		*!	*

For a similar situation, although with a compound noun: (e.g. *drugstore*)

	dru[gs]store	AGREE	IDENTONSET(voice)	FAITH
☞	.dru[k.s]store.			*
	.dru[g.s]store.	*!		
	.dru[g.z]store.		*!	*

The devoicing is valid also for a monomorphemic word (e.g. *lobster*) and a bimorphemic word (e.g. *tubful*):

	lo[bs]ter	AGREE	IDENTONSET(voice)	FAITH
☞	.lo[p.s]ter.			*
	.lo[b.s]ter.	*!		
	.lo[b.z]ter.		*!	*

	tu[bf]ul	AGREE	IDENTONSET(voice)	FAITH
☞	.tu[p.f]ul.			*
	.tu[b.f]ul.	*!		
	.tu[b.v]ul.		*!	*

To summarize the following needs to be said. M.B devoices a vast majority of word-final [+voice] obstruents with only 2 situations where the voicing is maintained. For all tokens where obstruent-obstruent clusters came into play (across morpheme or word boundaries), the [+voice] phonemes were devoiced due to the adjacent [-voice] obstruent that followed. However, even though in this speaker the voice adjustment works for the [+voice][-voice] sequence, it absolutely does not work for the inverse combination [-voice][+voice] where no changes occur. Finally, the assimilation (towards a devoiced segment) works for both words in separation (e.g. *lobster, tubful*) as well as those found within a sentence (provided the requisite environment is maintained of course).

6.3 Data from an elementary level

The data which is meant to represent the elementary level of English was read by a male J.D, aged 23. He has been learning English for 9 years now, with English lessons taken at state schools only, in the form of regular classes.

6.3.1 Devoicing

J.D, as opposed to the previous speaker, has a few more instantiations of maintaining voicing for word-final obstruents. This can be observed for words such as: *e[g], ba[ʤ], gara[ʒ] (*used both in isolation as well as in a sentence). Although the number of words is not big, one can easily observe a tiny inclination towards [+voice] stops. Nonetheless, the devoiced segments are still in the vast majority, especially in the sentences read by J.D. For this reason, one might be tempted to formulate 2 kinds of tableaux for this

speaker. Apparently, the speaker might be beginning to have some traces of the English ranking in place. It, in most probability, is working along with the Polish ranking of constraints. However, one should not forget that it is the Polish ranking that is dominant for this speaker. Since the Polish rankings operative for M.B (beginner level) have been extensively presented and commented on, we may expect that they will also be valid for this speaker. The only tableaux that needs to be introduced here comprises of reordered rankings of Polish which in the end are the rankings of English that will cater for those "undevoiced" forms which emerged with this speaker.

	ba[ʤ]	IDENT(voice)$_{Onset}$	IDENT(voice)	*VOICEDCODA	FAITH
☞	.ba[ʤ].			*	*
	.ba[ʧ].		*!		*

For this ranking two constraints had to be reordered. The Polish ranking was formulated in the following way: IDENT(voice)$_{Onset}$>>*VOICEDCODA>> IDENT(voice)>> NOCODA
If we now leave out the two outer constraints and rerank the two middle constraints: *VOICEDCODA>> IDENT(voice) so that they are IDENT(voice) >> *VOICEDCODA we have a ranking operative for English that allows us to yield the optimal candidates for J.D – but this applies only to those candidates which are pronounced in the English "undevoiced" manner. The other ranking (neutralizing coda-based approach) may also resolve this pronunciation pattern.

	ba[ʤ]	IDENT(voice)	FINALDEVOICE	*VOICEDCODA	NOCODA
	ba[ʧ]	*!			*
☞	ba[ʤ]		*	*	*

For this ranking there has only been a need to reorder two highly ranked constraints, namely IDENT(voice) and FINALDEVOICE. Consequently, the ranking FINALDEVOICE>> IDENT(voice)>>*VOICEDCODA>>NOCODA has been changed into: IDENT(voice)>> FINALDEVOICE >> *VOICEDCODA>> NOCODA. The working of such a ranking for the voice coda obstruent /ʤ/ in the word *badge* will then look as follows: ba[ʧ] will fatally violate the high-ranked constraint IDENT(voice) and by virtue of that it can be eliminated straightaway. Although ba[ʤ] has 3 single violations, they are so minor in terms of their place in the ranking that this candidate can still win in this case.

6.3.2 Voice adjustment

As far as voice adjustment is concerned, there are some new elements present for speaker J.D that were absent for M.B. When we analyze the data sets from the elementary speaker we may discern that there are two situations where the voicing is not lost in the presence of a [-voice] obstruent that follows. That is for words: *bagpipe* and *friendship*. Such a situation may again tempt us into drawing a conclusion that this speaker displays some even more audible traces of an inclination towards an English ranking. Once again, like previously one may presume that there might be two rankings operative for voice adjustment too. Along with the ranking for Polish-based forms we may have to have it reordered to cater for English-based pronunciations and formulated in the following way: FAITH>> IDENTONSET(voice)>> AGREE as illustrated by the tableaux below:

	frien[dʃ]ip	FAITH	IDENTONSET(voice)	AGREE
	.frien[t.ʃ]ip.	*!		
☞	.frien[d.ʃ]ip.			*
	.frien[d.ʒ]ip.		*!	

The Polish-sounding realization .frien[t.ʃ]ip. has been declined by this speaker by virtue of the high-ranked constraint FAITH being fatally violated. For this token AGREE does not seem to play any crucial role as it is low-ranked and even though it is violated by the optimal candidate, it does not stop it from winning. A similar commentary on violations will be valid for the other token where the voicing is maintained i.e. *wildcat.*

	wil[d k]at	FAITH	IDENTONSET(voice)	AGREE
	.wil[t.k]at.	*!		
☞	.wil[d.k]at.			*
	.wil[d.g]at.		*!	

In fact for this speaker we have the two above-mentioned situations where there is no devoicing in voice adjustment. Nevertheless, in the remaining 17 tokens the voice is indeed adjusted in favour of the devoiced obstruent, in exactly the same fashion, as has been illustrated by the tableaux in 6.2. No progressive assimilation resulting in voicing can be traced.

6.4 Data from a lower-intermediate level

The data sets covering the lower-intermediate level come from a 28-year-old B.W. She has been learning English for 6 years in total (i.e. 4 years between 1995 and 1999 and since 2006 until today).

6.4.1 Devoicing

The data collected from this speaker is not yet very significant for our analysis. Nevertheless, it may show a transitory stage in between levels of English of the speakers investigated. As the patterns emerging for this speaker are very similar to those found in the elementary-level speaker there is hardly anything else one can comment on. For sure, however, it needs to be noticed that with this speaker we are confronted with a slight increase in the number of fully voiced obstruents in the endings. As opposed to the 2-3 cases in each speaker previously, here we have 5 tokens where the word-final obstruent may be attributed a [+voice] feature without any doubt (this is legitimate for words such as: *egg, bed, Maz, flag* and *sand*). Should we want to make it more statistical, it appears that this speaker does not devoice the obstruents in half the cases which may be a great step forward towards the English ranking. Finally, since this case does not differ significantly from the previous one in terms of possible rankings we shall not focus on the tableaux here.

6.4.2 Voice adjustment

As far as voice adjustment is concerned, it is interesting to observe that B.W has completely devoiced all of the possible tokens with obstruent clusters. Therefore, it indicates that she employs the Polish ranking of constraints for all cases of voice assimilation within words and this is quite peculiar since her realizations of single words were often undevoiced. It looks slightly different for fully-fledged sentences where pairs such as ba[dk]lub or ha[vg]ot receive full voicing. To summarize, one can conclude that the given speaker also has two types of rankings (like formerly i.e. Polish and English) operative for similar phonological environments. However, the reasons for speaker's internal choices have yet to be found out.

6.5 Data from an upper-intermediate speaker

A 22-year old male Pole – B.K has been assessed as an upper-intermediate learner of English. He has been learning English for 8 years now and has spent approximately 6 months in total in English-speaking countries. He assured that he has been attending both state school English classes as well as private English classes over the said period of 8 years.

6.5.1 Devoicing

Within the data collected from B.K one can immediately recognize a considerable change in the pronunciation of word-final obstruents. Out of all the separate words as well as words used in sentences we can only distinguish 1 token per each with easily audible devoiced obstruents. For all the remaining items one can identify clear voicing for word-final obstruents. There is, hence, a great probability that this speaker will apply English-oriented ranking most of the time while speaking in English. Therefore, the two rankings that one can choose from will work for him in the following way:

	ba[ʤ]	IDENT(voice)	FINALDEVOICE	*VOICEDCODA	NOCODA
	ba[ʧ]	*!			*
☞	ba[ʤ]		*	*	*

	fla[g]	IDENT(voice)	FINALDEVOICE	*VOICEDCODA	NOCODA
	fla[k]	*!			*
☞	fla[g]		*	*	*

This case is very similar to the one in 6.3.1 and what should only be said is that it was again sufficient to move the constraint IDENT(voice) to the top position so as to yield optimal winning candidates with a voiced obstruent in the word-final (coda) position. Obviously, in the other approach we are working on, the same final results can be obtained by a mere application of the reranking as proposed in 6.3.1:

	ba[ʤ]	IDENT(voice)$_{Onset}$	IDENT(voice)	*VOICEDCODA	FAITH
☞	.ba[ʤ].			*	*
	.ba[ʧ].		*!		*

	fla[g]	IDENT(voice)$_{Onset}$	IDENT(voice)	*VOICECODA	FAITH
☞	fla[g]			*	*
	fla[k]		*!		*

For these two rankings the fatal violation of IDENT(voice) with most certainty solves the problem of choosing the optimal candidate and consequently the realizations with [+voice] obstruents win.

6.5.2 Voice adjustment

With this speaker the voice adjustment is active in 7 cases only. This results in a situation where one can observe a rapid increase of [+voice] obstruents in the coda position as opposed to the previous speakers where VA was applied for a substantial number of realizations where obstruents lost their voicing because of the [-voice] phoneme that followed. The above might indicate that this speaker not only has two orders of each ranking being applied to final (de)voicng but also that there are two parallel orders of ranking operative for voice adjustment. If that is true, we can distinguish a ranking where VA is indeed active and allows us to yield winning candidates such as e[kʃ]ake, chee[sk]ake etc. as well as a ranking where VA is switched off and realizations such as ra[gt]ime or Be[df]ord are the optimal candidates. The above-mentioned two rankings will work in the following way:

	ra[gt]ime	FAITH	IDENTONSET(voice)	AGREE
	.ra[k.t]ime.	*!		
☞	.ra[g.t]ime.			*
	.ra[g.d]ime.		*!	

ragtime will have its [+voice][-voice] obstruent sequence pronounced without voicing agreement when FAITH>> IDENTONSET(voice)>>AGREE ranking is applied. Only then will the candidates with voicing agreement be violating the highest constraint FAITH which is enough to have them rejected.

	bo[bt]ail	AGREE	IDENTONSET(voice)	FAITH
	.bo[b.t]ail.	*!		
☞	.bo[p.t]ail.			*
	.bo[b.d]ail.		*!	*

As for the analysis where a sequence with voicing agreement is yielded, one can observe that crucial violations of AGREE excludes the candidate .bo[b.t]ail. whereas an absolutely nonce candidate .bo[b.d]ail. is rejected by virtue of the violation of IDENTONSET(voice). Again, FAITH does not seem to play any role for the given cases.

6.6 Data from an advanced speaker

The data of an advanced speaker comes from a 30-year old female J.S, who has been learning English for more than 10 years now. She has been taught English in both private and state schools. In addition, over the last 12 years she has spent about a year in English-speaking countries mostly working or travelling.

6.6.1 Devoicing

As far as single words are concerned, all tokens in question were [+voice] for this speaker. When, on the other hand, we look at similar words ending in underlyingly [+voice] obstruents but used in sentences, it can be observed that certain phonemes undergo devoicing whereas other do not. Moreover, it should perhaps be added that it is impossible to discern any kind of regularity or pattern governing these changes as sometimes the phoneme /d/ tends to be devoiced (e.g. ha[t], ba[t]) while in some other cases is retains its [+voice] feature for the coda obstruent (e.g. be[d], clu[b]) Since presenting tableaux here would simply be a repetition of those from previous chapters, one should only bear in mind that this speaker will also most definitely have two types of rankings (i.e. two orders of the ranking for each of the two given approaches) operative for speaking in a foreign language.

6.6.2 Voice adjustment

The voice adjustment appears to be a process quite actively working for J.S. Out of all the cases where VA could come into play there is just one case where it has not been activated (in the word *news<u>f</u>lash*). In all remaining tokens the voicing for the obstruent clusters agreed and was [-voice]. This is valid for both single words as well as adjacent words found in sentences. Like in 6.6.1 no tableaux will be presented here as they would only repeat the possible combinations of constraints from the previous speakers.

Nevertheless, what needs to be observed is that it is hardly possible to talk about this speaker as having two separate rankings for VA. This results from the fact that there was just one above-mentioned case where a [+voice][-voice] sequence occurred. This ought to be treated as a possible exception rather than a slight variation in the speaker's pronunciation and it should not distort the overall picture of the speaker's VA which is an active process most of the time.

6.7 Datasets summary

When we look at the datasets from the perspective of constraints we can see a number of regularities. Only if we collate them, can we draw various conclusions because when the datasets and also the rankings are brought together they give a much wider picture of what is happening in L2 phonology across the board. It should also be added that since not all devoiced items have been mentioned in the text, every one is referred to the appendices so as to see every speaker's realizations.

6.7.1 Towards marked structures in the datasets

First of all, one can observe that the more advanced a speaker becomes, the more often (s)he uses the marked structures. This can be proved by a comparative summary of all speakers' performance. Initially, the speakers of elementary and beginner level aim at unmarked structures in the word-final position (in this analysis it is [-voice] obstruents that will be construed as unmarked). This pertains to both single words as well as words extracted from sentences. As far as the constraints are concerned, we can observe that the two speakers give a special priority to these ones which will favour the unmarked structures and not necessarily facilitate lexical contrast (e.g. owing to the devoicing processes *bet* and *bed* or *foot* and *food* may be perceived as homophonous lexical units). Consequently, a constraint such as *VOICEDCODA will be ranked relatively high in order for simpler realizations to win. Nevertheless, with the progress that speakers make in the course of time and as they gradually become even more proficient users of English we can see that the constraints are reranked. The downgrading of *VOICEDCODA best shows this and it is quite explicitly illustrated by the difference between the lower-intermediate and upper-intermediate speaker where *VOICEDCODA has a top-ranked position with the lower level speaker as is demoted as we reach

the higher levels ending at the position of a low-ranked constraint. In the performance we can see that the lower-intermediate one is still inclined to use a Polish-like ranking which aims at unmarked structures while the upper-intermediate one tends to use more and more marked structures (voiced coda obstruents) which in this situation are typical of English. As has been shown in previous subchapters, the speakers' rankings mirrored either the Polish or English phonology. This could be concluded from all speakers above the beginner level who have employed both rankings depending on a given word only.

6.7.2 Frequency of L2 rankings

Another conclusion to be drawn is that, all in all, most speakers used both rankings but this does not mean that all of them represent the same level of advancement. Since we know that each and every one of them had a different command of English, we can speculate that there is something that allows us to tell them apart in terms of phonology. In chapter 3.2 it has been assumed that the final aim of learning a language is a rejection of L1 ranking (characteristic for lower level users of a second language) for the sake of L2 constraints' hierarchy. This can be observed with the speakers partaking in this analysis. Elementary level speakers used only L1 ranking whereas as we analysed more advanced users, it appeared that they are inclined to use L2 ranking. However, it is interesting to see how the users who used L2 ranking differed from one another. As it has already been established, the speakers from beginner level and on have used L2 rankings interchangeably with L1 rankings. The increase in the level of English is, however, reflected in the frequency of L2 rankings. Apparently, the better the command of English, the more often a given speaker applies the L2 (English) rankings in his/her phonology when speaking in that foreign language. A rough scale of this phenomenon could be described in the following way: the beginner speaker uses L2 ranking twice (although this, due to the small occurrence, should not be treated as present); the elementary level speaker uses it approximately 3 times; the lower-intermediate speaker has L2 rankings about 5 times in place and finally the upper-intermediate speaker uses L2 ranking 21 times while the advanced one applies it 17 times (for all 10 single words and in 7 sentences . To summarize it, we can infer that it is not only the reranking that defines the acquisition of second language phonology. If it were for the reranking only, then there would be no clear differentiation between various levels

of English. We need to further develop and amend our description of what second language phonology acquisition is in OT. From the datasets above and the various rankings that we have, we may perhaps surmise that the more L2 rankings occur with a given speaker (i.e. in ratio to L1 rankings) the better his or her command of the foreign language should be. In other words, the acquisition is not only reranking constraints (from L1 order towards L2 order) but also it is the frequency at which the L2 rankings occur for a particular speaker. The increase of the frequency should, in the end, lead to a much smaller number of errors that speakers make and so in case of final devoicing ought to result in fewer word-final obstruents being devoiced.

6.7.3 Voice adjustment summary

Because of the influence of an adjacent sound voice adjustment or devoicing an obstruent at a morpheme/word boundary cannot be uniformly summarised on the basis of the data presented. All in all, we have found an environment where final devoicing is very likely to occur for most of the speakers. However, there is not a uniform tendency towards e.g. [+voice][-voice] sequence of the obstruents which would be in tandem with the speakers' proficiency. On the one hand, we have the beginner learner where the voicing is assimilated for all the tokens in the data sets[9], but then we are confronted with the beginner where in two cases the voicing disagrees. Nevertheless, there is a big discrepancy among the higher levels where the upper-intermediate speaker applies the L2 rankings four times while a far more advanced speaker at a proficient level does it once only. To summarize, VA is perhaps not the most authoritative phonological phenomenon that can give a clear picture of reranking constraints with the improvement of a given speaker's command of L2. As we can see various Polish users of English obtained here different scores which did not agree with what has been assumed earlier in this work(Chapter 3.2) when we believed that a learner moves towards the L2 ranking as he/she becomes more proficient. The explanation behind this might have a number of possible aspects. One of them, perhaps, is that a [+voice][-voice] obstruent cluster is so marked that it comes very late in second language acquisition or at times does not even appear at all.

[9] This refers to regressive assimilation only.

Chapter 7: Discussion and final conclusions

The main objective of this research was to see if the progress made by the Polish speakers of English is in any way reflected in a formalized picture of their phonology which takes the form of Optimality Theory tableaux. As assumed earlier (e.g. 3.2), the acquisition of second language phonology in OT is prone to having various rerankings of constraints depending on the speaker's level of proficiency. The research here looks at this phenomenon also in order to see how the Poles' progress is expressed by downgrading certain constraints so that others can be promoted. Another aspect of the study was to see what the interim interlanguage stages are for the given speakers and yet again if they involve moving the constraints either up or down in the ranking. Finally, one must not forget about the concept of markedness that is also crucial for this analysis. The question asked initially was if any marked forms will emerge and should this happen what will they be and also at what level they are most likely to appear.

The findings of this research have confirmed all the components of the hypothesis put forward in 3.2. The elementary speaker does not reveal any tangible traces of L2 phonology and as a result, one may infer that production of English is mapped onto L1 constraint hierarchy. This leads to a situation where coda obstruents are devoiced in a prepausal position. Moreover, it proves that the given learner does not start acquiring a foreign language phonology as a *tabula rasa*, but in fact refers his/her production to the competence of the mother tongue he/she speaks.

As shown in chapter 6.7 when a given speaker becomes more proficient in a foreign language, the constraints need to be reranked. Consequently, constraints favouring unmarked forms (e.g. *VOICEDCODA) will tend to be downgraded whereas faithfulness constraints (e.g. IDENT(voice)) will be promoted for the sake of maintaining lexical contrasts. Also, one may conclude that since unmarked forms become less and less preferable with the progress a speaker makes, it may be valid to say that marked forms emerge. This would then, in turn, confirm the hypothesis constructed by Jakobson (as mentioned in 3.3) where he presumed that the marked forms are later in acquisition and harder to articulate. If we refer the results of this study to what Jakobson claimed, it appears that voiceless codas are indeed unmarked. The justification for that emerges from the picture of the progress made by the speakers. Initially, a voiceless coda is

opted for, but as we move up the proficiency ladder we can see that the frequency of voiced codas surges reaching realizations of almost all of them with the upper-intermediate and advanced speaker. Hence, our speakers confirm Jakobson's assumption concerning the acquisition of language (in this case from the perspective of second language acquisition).

The findings of this research have also confirmed the third component of the hypothesis that was put forward at the beginning of the dissertation. We assumed that there might be some indications of an interim interlanguage which results from the movements of the relevant constraints either up or down the ranking. From the tableaux established for the speakers in this study we can see that indeed those ones characterised as elementary or intermediate speakers do have an interlanguage phonology. However, this kind of phonology is not at all stable and we could see that it is bound to work for some of the tokens whereas it will not work for the others. Unfortunately, no traces of any form of regularity could be identified. Overall, some of the learners from the middle of the proficiency spectrum used the Polish and English ranking interchangeably which resulted in them applying final devoicing in random phonological environments.

There is one conclusion that was not predicted but which emerged as the speakers' performances were being analysed. At first, we assumed that there would be constraints rerankings and that the speakers should, in most probability, be inclined towards the L2 ranking as they approach a more advanced stage of English. However, it seems to be worth trying to capture the difference between the speakers of different levels. Although it has not been confirmed by any statistical calculations, but only by a mere comparison of the number of the realizations of voiced obstruents in the speakers, one can conclude that the progress is also reflected in the frequency of the correctly realized L2 structures i.e. L2 rankings. In other words, as was discussed in 6.7.2, the bigger the number of L2 rankings in a given learner, the less L1-induced errors she/he is prone to making.

Finally, one should also not forget about the voice adjustment discussed in this study. There is a tendency among the speakers to make the obstruent clusters harmonic. It happens so in Bo[p t]ail, chee[s k]ake or tu[p f]ul where the coda obstruent is devoiced due to the [-voice] obstruent that follows. If we now assume (as it is in the regressive assimilation) that the first segment in the process [+voice] obstruent is the target

whereas the second one [-voice] is the trigger we may draw quite interesting conclusions. It appears that the more marked segment is influenced by an unmarked segment that follows. Hence, if we assume that one of them is marked and the other is unmarked, that is contrary to Jakobson's hypothesis where he assumed that the marked structure is the trigger of an assimilation process. Moreover, if we take a look at an inverse combination i.e. [-voice] obstruent followed by a [+voice] obstruent there is no voice assimilation/adjustment occurring for our speakers. In this situation it looks as if the more marked [+voice] phoneme does not influence the preceding unmarked segment either which, all in all, contradicts one of Jakobson's assumptions. The above allows us to claim that devoicing assimilation may be unmarked in relation to voicing. Moreover, Polish may behave like some other languages/dialects (e.g. Yorkshire devoicing studied by Broadbent (1996)) where devoicing is only a regressive assimilation process and affects only these segments which are followed by voiceless phonemes and not inversely.

The above research has confirmed the hypothesis formulated at the beginning. Nevertheless, it still leaves a number of questions unanswered or issues that could not be exhausted due to length restrictions. First of all, a further study involving statistics could be conducted. It should involve a greater number of participants so that there is a smaller chance of making any statistical mistakes. It could aim at answering questions such as: what is the correlation between the level of a speaker's command of L2 and the application of L2 phonology rankings. It might be possible to establish a percentage occurrence of L2 rankings for each level and see if this works regularly for more than just a single speaker. The other aspect worth investigating is that involving voice adjustment. As we have been shown, Polish is a language where two obstruents in a cluster must be harmonic in their voice. However, this is only partly transferred onto the English acquired by the speakers in this research. Therefore, a further study may look to see if cluster voicing agreement is indeed unmarked as from this research it emerges that disharmonic clusters are much rarer than harmonic ones and the latter seem to be acquired much more early and easily. Such a research could, in fact, involve speakers of more than just two languages to be investigated.

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Appendix 1: List of words to be read by the speakers

Egg	Bobtail	Misjudge
Bed	Soundtrack	Flashback
Luck	Ragtime	Archbishop
Rock	Wildcat	I never go to a bad club.
Photo	Cheesecake	Do you like this music?
Rob	Tubful	My sister has six dogs.
See	Bedford	My uncle never had a cat.
Flag	Newsflash	He is five.
Bet	Lobster	She is six.
Sand	Redskin	It's not bad.
Paper	Drugstore	How are you?
Elegant	Livestock	Is he happy?
Maz	Friendship	Can you see his leg?
Pilot	Eggshake	John goes to London.
Cab	Madhouse	I want to buy a badge.
Electric	Egghead	Are you sure?
Home	Shipbuilder	Yes, she has.
Door	Sheepdog	His name is Raz.
Cheese	Upgrade	Do you find it smooth?
Window	Postbox	Oh my God!
Pen	Shutdown	She lost her bag.
Garage	Coastguard	Do you have any news?
Flower	Blackberry	You have got a book.
Box	Workday	Where's Bob?
Wives	Lifeboat	I can't hear any sound.
Pencil	Lifeguard	I print my text.
Bedpan	Toothbrush	Is she your best friend?
Bagpipe	Textbook	
Townspeople	Disgrace	

Appendix 2: List of speakers' realizations

(pronounced phonemes are provided in the square brackets)

Egg [k]

Bed [t]

Luck [k]

Rock [k]

Photo n/a

Rob [p]

See n/a

Flag [k]

Bet [t]

Sand [t]

Paper n/a

Elegant n/a

Maz [s]

Pilot n/a

Cab [p]

Electric n/a

Home n/a

Door n/a

Cheese [s]

Window n/a

Pen n/a

Garage [ʒ]

Flower n/a

Box n/a

Wives [s]

Pencil n/a

Bedpan [tp]

Bagpipe [kp]

Townspeople [sp]

Bobtail [pt]

Soundtrack [tt]

Ragtime [kt]

Wildcat [tk]

Cheesecake [sk]

Tubful [pf]

Bedford [tf]

Newsflash [sf]

Lobster [ps]

Redskin [ts]

Drugstore [ks]

Livestock [fs]

Friendship [tʃ]

Eggshake [kʃ]

Madhouse [th]

Egghead [kh]

Shipbuilder [pb]

Sheepdog [pd]

Upgrade [pg]

Postbox [tb]

Shutdown [td]

Coastguard [tg]

Blackberry [kb]

Workday [kd]

Lifeboat [fb]

Lifeguard [fg]

Toothbrush [fb]

Textbook [tb]

Disgrace [sg]

Misjudge [sʤ]

Flashback [ʒb]

Archbishop [xb]

I never go to a bad [tk] club.

Do you like this music? n/a

My sister has [ss]six dogs. [ks]

My uncle never had [t] a cat.

He is five. [f]

She is [ss] six.

It's not bad. [t]

How are you?

Is he happy?

Can you see his leg? [k]

John goes [s] to London.

I want to buy a badge. [ʤ]

Are you sure?

Yes, she has. [s]

His name is Raz. [s]

Do you find it smooth? [t]

Oh my God! [t]

She lost her bag. [k]

Do you have any news? [s]

You have [fg] got a book.

Where's Bob? [p]

I can't hear any sound. [t]

I print my text.

Is she your best friend? [t]

Age: 34	Beginner
Female	M.B

Egg [g]

Bed [t]

Luck [k]

Rock [k]

Photo n/a

Rob [p]

See n/a

Flag [k]

Bet [t]

Sand [t]

Paper n/a

Elegant n/a

Maz [s]

Pilot n/a

Cab [p]

Electric n/a

Home n/a

Door n/a

Cheese [s]

Window n/a

Pen n/a

Garage [ʒ]

Flower n/a

Box n/a

Wives [s]

Pencil n/a

Bedpan [tp]

Bagpipe [gp]

Townspeople [sp]

Bobtail [pt]

Soundtrack [tt]

Ragtime [kt]

Wildcat [tk]

Cheesecake [sk]

Tubful [pf]

Bedford [tf]

Newsflash [sf]

Lobster [ps]

Redskin [ts]

Drugstore [ks]

Livestock [fs]

Friendship [ds]

Eggshake [kʃ]

Madhouse [th]

Egghead [kh]

Shipbuilder [pb]

Sheepdog [pd]

Upgrade [pg]

Postbox [tb]

Shutdown [td]

Coastguard [tg]

Blackberry [kb]

Workday [kd]

Lifeboat [fb]

Lifeguard [fg]

Toothbrush [fb]

Textbook [tb]

Disgrace [zg]

Misjudge [zʤ]

Flashback [ʒb]

Archbishop [xb]

I never go to a bad [tk] club.

Do you like this music? n/a

My sister has [ss]six dogs.

My uncle never had [t] a cat.

He is five. [f]

She is [ss] six.

It's not bad. [t]

How are you?

Is he happy?

Can you see his leg? [k]

John goes [s] to London.

I want to buy a badge. [ʤ]

Are you sure?

Yes, she has. [s]

His name is Raz. [s]

Do you find it smooth? [t]

Oh my God! [t]

She lost her bag. [k]

Do you have any news? [s]

You have [fg] got a book.

Where's Bob? [p]

I can't hear any sound. [t]

I print my text. n/a

Is she your best friend? [t]

Age: 23	**Elementary**
Male	**J.D**

Egg [g]

Bed [d]

Luck [k]

Rock [k]

Photo n/a

Rob [p]

See n/a

Flag [g]

Bet [t]

Sand [d]

Paper n/a

Elegant n/a

Maz [z]

Pilot n/a

Cab [p]

Electric n/a

Home n/a

Door n/a

Cheese [s]

Window n/a

Pen n/a

Garage [ʒ]

Flower n/a

Box n/a

Wives [s]

Pencil n/a

Bedpan [tp]

Bagpipe [kp]

Townspeople [sp]

Bobtail [pt]

Soundtrack [tt]

Ragtime [kt]

Wildcat [tk]

Cheesecake [sk]

Tubful [pf]

Bedford [tf]

Newsflash [sf]

Lobster [ps]

Redskin [ts]

Drugstore [ks]

Livestock [fs]

Friendship [tʃ]

Eggshake [kʃ]

Madhouse [th]

Egghead [kh]

Shipbuilder [pb]

Sheepdog [pd]

Upgrade [pg]

Postbox [tb]

Shutdown [td]

Coastguard [tg]

Blackberry [kb]

Workday [kd]

Lifeboat [fb]

Lifeguard [fg]

Toothbrush [fb]

Textbook [tb]

Disgrace [sg]

Misjudge [sʤ]

Flashback [ʃb]

Archbishop [xb]

I never go to a bad [dk] club.

Do you like this music? n/a

My sister has [ss]six dogs.

My uncle never had [t] a cat.

He is five. [f]

She is [ss] six.

It's not bad. [t]

How are you?

Is he happy?

Can you see his leg? [k]

John goes [s] to London.

I want to buy a badge. [tʃ]

Are you sure?

Yes, she has. [s]

His name is Raz. [s]

Do you find it smooth? [t]

Oh my God! [t]

She lost her bag. [k]

Do you have any news? [s]

You have [vg] got a book.

Where's Bob? [p]

I can't hear any sound. [t]

I print my text. n/a

Is she your best friend? [t]

Age: 27	**Lower-intermed.**
Female	**B.W**

Egg [g]

Bed [d]

Luck [k]

Rock [k]

Photo n/a

Rob [b]

See n/a

Flag [g]

Bet [t]

Sand [t]

Paper n/a

Elegant n/a

Maz [z]

Pilot n/a

Cab [b]

Electric n/a

Home n/a

Door n/a

Cheese [z]

Window n/a

Pen n/a

Garage [dʒ]

Flower n/a

Box n/a

Wives [vz]

Pencil n/a

Bedpan [tp]

Bagpipe [kp]

Townspeople [sp]

Bobtail [pt]

Soundtrack [tt]

Ragtime [gt]

Wildcat [dk]

Cheesecake [sk]

Tubful [bf]

Bedford [df]

Newsflash [zf]

Lobster [ps]

Redskin [ts]

Drugstore [ks]

Livestock [fs]

Friendship [ds]

Eggshake [kʃ]

Madhouse [dh]

Egghead [gh]

Shipbuilder [pb]

Sheepdog [pd]

Upgrade [pg]

Postbox [tb]

Shutdown [td]

Coastguard [tg]

Blackberry [kb]

Workday [kd]

Lifeboat [fb]

Lifeguard [fg]

Toothbrush [fb]

Textbook [tb]

Disgrace [zg]

Misjudge [zdʒ]

Flashback [ʒb]

Archbishop [tʃb]

I never go to a bad [dk] club.

Do you like this music? n/a

My sister has [ss]six dogs. [gz]

My uncle never had [d] a cat.

He is five. [v]

She is [ss] six.

It's not bad. [d]

How are you?

Is he happy?

Can you see his leg? [g]

John goes [z]] to London.

I want to buy a badge. [dʒ]

Are you sure?

Yes, she has. [z]

His name is Raz. [z]

Do you find it smooth? [θ]

Oh my God! [d]

She lost her bag. [g]

Do you have any news? [z]

You have [vg] got a book.

Where's Bob? [p]

I can't hear any sound. [d]

I print my text. n/a

Is she your best friend? [d]

Age: 22	**Upper-intermed.**
Male	**B.K**

Egg [g]

Bed [d]

Luck [k]

Rock [k]

Photo n/a

Rob [b]

See n/a

Flag [g]

Bet [t]

Sand [d]

Paper n/a

Elegant n/a

Maz [z]

Pilot n/a

Cab [b]

Electric n/a

Home n/a

Door n/a

Cheese [z]

Window n/a

Pen n/a

Garage [ʒ]

Flower n/a

Box n/a

Wives [vz]

Pencil n/a

Bedpan [tp]

Bagpipe [kp]

Townspeople [sp]

Bobtail [pt]

Soundtrack [tt]

Ragtime [kt]

Wildcat [tk]

Cheesecake [sk]

Tubful [pf]

Bedford [tf]

Newsflash [zf]

Lobster [ps]

Redskin [ts]

Drugstore [ks]

Livestock [fs]

Friendship [ds]

Eggshake [kʃ]

Madhouse [th]

Egghead [kh]

Shipbuilder [pb]

Sheepdog [pd]

Upgrade [pg]

Postbox [tb]

Shutdown [td]

Coastguard [tg]

Blackberry [kb]

Workday [kd]

Lifeboat [fb]

Lifeguard [fg]

Toothbrush [θb]

Textbook [tb]

Disgrace [zg]

Misjudge [zʤ]

Flashback [ʃb]

Archbishop [ʧb]

I never go to a bad [tk] club.[b]

Do you like this music? n/a

My sister has [ss]six dogs. [gz]

My uncle never had [t] a cat.

He is five. [f]

She is [ss] six.

It's not bad. [t]

How are you?

Is he happy?

Can you see his leg? [g]

John goes [s] to London.

I want to buy a badge. [ʧ]

Are you sure?

Yes, she has. [s]

His name is Raz. [s]

Do you find it smooth? [t]

Oh my God! [d]

She lost her bag. [g]

Do you have any news? [s]

You have [fg] got a book.

Where's Bob? [b]

I can't hear any sound. [t]

I print my text. n/a

Is she your best friend? [t]

Age: 30	Advanced
Female	J.S