

Does every American get to sound the same?
Sound variations of American English based on the
cot-caught merger

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1. Introduction

Regardless of the changes in American English, the cot-caught merger can be identified as a firm distinction between West Coast American and East Coast American English. Scholars have different opinions on the subject of sound change on the North American continent, but proof can be found to support the idea of the difference between the dialects of the two coasts. This paper's main aim is to investigate this difference.

This dissertation consists of five chapters. After the introduction to the topic and the main research aims in the first chapter, the second part will define American English, mergers, chain shifts and the cot-caught merger. The third chapter is about academic debates on the topic of the changing tendencies of American English, highlighting the one which can be found in *The Politics of Language Change: Dialect Divergence in America* (Labov, 2010). Here Labov (2010) points out the differences that exist between certain dialects and questions the validity of an article he found back in 2010. The site's name is *Dr. Goodword's Language Blog* and it contains a text in which the disappearance of American accents is argued by the owner of the webpage, Robert Beard. The fourth chapter introduces an original research project seeking to provide evidence for the existence of a difference between West Coast and East Coast American English dialects through the cot-caught merger. Finally, the fifth part is the conclusion, where personal ideas are compared with that of the authors' thoughts which were quoted about the situation of the cot-caught merger and an evaluation is given of the results of the paper.

Throughout this paper IPA symbols and realizations are used in order to describe sounds and sound changes. As the only exception, the concepts from the Atlas of North American English are explained using the original symbols from that source for clarity. However, these symbols are also related to the IPA symbols to avoid confusion.

2. Defining the concepts

2.1 Defining North American English

We use the term North American English when we refer to the English of the United States of America and Canada (Labov, Ash, & Boberg, 2005). Probably the most distinctive feature of North American dialects is the pronunciation of the post-vocalic /r/, in other words rhoticity. However, it has to be clarified at the very beginning that not all dialects are rhotic on the continent. Several regional vernaculars, such as New York English, Bostonian English, Rhode Islander English and some varieties of Southern English can be identified as non-rhotic dialects.

Another noticeable characteristic of American English is the so called intervocalic flap /ɾ/. Intervocalic flap occurs when a /t/ phoneme appears between two vowel sounds and the /t/ sound is altered into the allophonic variety of this phoneme, which sounds much like the phoneme /d/, for example in the words *water* / 'wɔ:ɾ ə/ or *butter* / 'bʌɾ ə/. This feature is much more homogenous than post-vocalic /r/. Even in such non-rhotic accents as Bostonian or Rhode Islander or in terms of New York accents¹ the intervocalic flap is used (Labov, Ash, & Boberg, 2005).

Concerning the vowel system, the initial position of the North American vowel system is best described by Labov, Ash and Boberg (2005) in the Atlas of North American English (from now on ANAE). In Table 1, the two tables are fused together so that the vowel sounds and the examples for them can be seen in one table instead of two.

¹ The regional boundaries of North American English are not going to be described in this paper; the structure established in ANAE (Atlas of North American English) is applied.

The North American vowel system								
	SHORT		LONG					
	V		Upliding				Ingliding	
			Front upgliding		Back upgliding			
			Vy		Vw		Vh	
nucleus	front	Back	front	back	front	Back	unrounde d	rounded
high	i (bit)	u (put)	iy (beat)		iw (suit)	uw (boot)		
mid	e (bet)	ʌ (but)	ey (bait)	oy (boy)		ow (boat)		oh (bought)
low	æ (bat)	o (cot)		ay (bite)		aw (bout)	ah (balm)	

Table 1: The North American vowel system based on Labov, Ash and Boberg (2005)²

Naturally, when it comes to two big types of dialects as American English and British English, it has to be noted that even though the phonemes of the language may sound the same, the British and American equivalents are rather dissimilar both in the case of vowels and consonants, not to speak of the fact that there are different allophones and in various cases even the usage of phonemes are not alike in many words.

On the East Coast (New England, New York, Mid-Atlantic States, and South) there are still phonological remnants of British speech and this is one of the main factors which makes American English heterogeneous. Although American English is more homogenous than its British counterpart, there is still a huge variety of dialects always in change.

Perhaps William Labov's biggest finding is the currently undergoing so called chain shift³ in the Inland North linguistic region (Chicago and Great Lakes area), the Northern Cities Shift (Labov, 2006). The basic idea is that people's vowel system in this territory is currently under a big change and this phenomenon is rather similar to the Big Vowel Shift, which occurred in the times of Shakespeare and Chaucer back in England. Linguists' curiosity might derive from the fact that such a major language change has not occurred in English in modern times.

² In this table /o/ stands for the IPA /ɒ/ sound and /oh/ is /ɑ:/ based on IPA symbols.

³ See below in the subchapters *Sound changes on the North American continent* and *Mergers and Chain Shifts*.

The standardized dialect form, better known as General American⁴, is the one which we refer to when we are talking about the speech of Americans in general (Wells, 1982). It is used in the news broadcasts, on YouTube, in movies and in several other branches of the media. While it is widely believed that General American is an existing simplified accent form, scholars say otherwise. According to Labov, Ash and Boberg (2005) General American does not exist. First of all, it would be indeed impossible to talk about such homogeneity in a vast country such as the United States of America. Secondly, there will always be language differences for social, economic and historical reasons. However, these distinctions are so small that only experts can discriminate between them. Because of this, all these accent variations tend to be labeled as General American by everyday speakers. Let us introduce two theories about the hypothetical existence of this speech form. The General American speech area comprises the West, Midwest, Inland North, and both parts of the South and the Mid-Atlantic States (Bronstein as cited in Wells, 1982). On the one hand, the phonetic and phonological differences might be so little that they can be hardly heard, which makes it difficult to discriminate between them. On the other hand, there are well-known regional speech varieties, such as the Southern accents or the African-American English Vernacular (from now on AAVE) which are so stigmatized in northern or western communities that children are taught to talk in a more standard way and there are also adults who take lessons in order to get rid of their strong accents.

What I found most interesting is the fact that there are two opinions about the variation of North American English in the academic community based on my readings so far. (i) American English only differs in terms of vowels and (ii) American English differs both in the pronunciation of vowels and consonants. ANAE's authors say that vowels are the only sounds changing in American English, but both Wells (1982) and some coauthors of *American Voices* stated the existing variation of consonants in the English of the North American continent. I find the second opinion more justifiable that there are also regional consonantal allophone variations. For example, on the East Coast some people pronounce the word street, as /ʃtri:t/ instead of saying /stri:t/ (Durian, 2007).

⁴ General American is the name of the standardized accent form; it is not the same as North American English.

2.2 Sound changes on the North American continent

The topic of sound change in North America has always been an interest to both linguists and curious readers. In a relatively short period of time, let us say, 400 years (since 1620, the arrival of Mayflower) a very much different English evolved separately from its original roots. There have been many theories why it had occurred at such a rapid rate. Despite the fact that the Puritans' English was somewhat a starting point in the evolution of American English, we should not forget about later influences on the language, for example, the British reign of the colonies or the huge immigrant migration throughout the history of the United States. Moreover, it also has to be noted that rhoticity, as we know it today, is a late 20th century phenomenon and the pronunciation of the post-vocalic /r/ is a major distinctive feature of recent American English.

Let us propose that Scotch-Irish English, German, Creole and even Finnish in some regions made a great impact upon the development of English in North America. As in Britain, also in the US, there have been social influences on language change. Let me give a few examples here as well. The social prestige level of rhoticity is a matter of region and time. Some Eastern Coast accents tend to retain non-rhoticity for more than just social reasons. It is a well-known fact that Southern American English is highly stigmatized in the northern states.

To exemplify this with a short anecdote, I visited my high school for the reason that students and teachers organized a so called American Day. As one of the main guests of the event, the school invited one of the current Hungarian-American ambassadors. The lady came from Texas. After a short presentation about her job, the students who were present, including me, were allowed to ask questions. I asked her why she did not have a Southern accent and she responded that as a representative of the United States of America, working in an international field, she had to pick up a standardized speech form of her mother tongue in order not to get stigmatized.

Some varieties of New York accents are also stigmatized. Wells (1982) discussed this topic and gave evidence by adding some data from William Labov's surveys which he conducted in New York City in the '60s. Wells claims that non-rhoticity and non-standard grammar usage were followed by high levels of stigmatization. In a matter of a century, which is roughly the life span of four generations of people, the situation regarding rhoticity has changed severely. Even though

it can be still heard in New Yorkers' speech, there is a smaller tendency of exertion (Wells, 1982).

AAVE also has a stigmatization-worn history. As a branch of Southern American English, it has also met similar difficulties as its southern counterpart, not to speak of the racism hovering above this dialect. After the Civil War, African-Americans families were leaving their home behind so as to find new ones in the northern states. Back in the southern regions, they had already used another variety of English than that of white people. In recent years, AAVE has been associated with ghetto speech and rap music.

These examples suggest a large number of dialectal variations in North America. Some of them seem to be so distinct from the rest that they meet with stigmatization and discrimination. Throughout the history of the continent, since the arrival of white people, the relationships between different ethnic, political and regional groups: French and British, Indians and Whites, Blacks and Whites, northern states and southern states, etc. have been critical. This seems to indicate clashing opinions and linguistic features as well.

The fact that British English is more heterogeneous than American English does not mean that there is no dialectal diversity on the North American continent. In fact, in recent years, as English has become the lingua franca, it was American English which has the greater impact on English in general. Eckert and Mendoza-Denton (2006) described the roots of the Californian discourse marker *like*. Even though it is a recent linguistic phenomenon, it has spread throughout the entire English-speaking community. The younger generations tend to pick it up at a rapid rate not just in California, but on the East Coast and in Britain as well. Despite its popularity and wide-spread use, as usually all new language features, speakers using it have been gotten stigmatized. The reason for that is its association with Valley Girl speech and uneducated individuals.

2.3 Mergers and chain shifts

According to Hickey (2004, p. 1) “a merger is taken to exist when two systemic sounds which were distinguished by speakers come not to be so, i.e. they become a single sound.” There are two main types of mergers when we talk about North American English:

- a) Nearly completed mergers (Labov, Ash, & Boberg, 2005)
- b) Mergers in progress (Labov, Ash, & Boberg, 2005)

Labov, Ash and Boberg (2005) report that the nearly completed mergers are only not exerted in some conservative regions of the country.

When we talk about mergers in progress in North America we refer to the sound change of roughly the last three generations of the population. It should be noted that the existence of half-mergers has to be taken into consideration as speakers do not change the way they talk, speech patterns evolve on their own without people noticing it generation after generation.

Labov (1994) mentions two principles regarding mergers.

- a) *Garde's Principle*: Mergers are irreversible by linguistic means.
- b) *Herzog's Corollary*: Mergers expand at the expense of distinctions.

Garde's Principle says that mergers are the results of language development and *Herzog's Corollary* tells us that mergers are expanding and speakers of nearby regions are picking it up from those who already have the merger. Unlike chain shifts in which case a number of vowel variations occur, when merging happens a phoneme disappears from a speaker's speech (Labov, Ash, & Boberg, 2005). For example, in case of the cot-caught merger, speakers do not use the phoneme /ɒ/ as it has merged with the sound /ɑ:/. Labov, Ash and Boberg (2005) say that a merger can trigger a chain shift as there will be space in the individual's phoneme system.

2.4 Introducing the cot-caught merger

The presence or absence of the cot-caught merger is probably one of the most recognizable sound differences between accents. For the persons who have the merger *cot* and *caught*, *don* and *dawn* may sound the same. There are two alternative interpretations of this merger.

a) Labovian interpretation:

Labov, Ash and Boberg (2005) explain the nature of the cot-caught merger by pointing out that the merger occurs when short-o class vowels and long open-o class vowels become the /oh/ or based on IPA the /ɑ:/ sound.

b) Wellsian interpretation is that the sounds /ɔ:/ and /ɒ/ become /ɑ:/ (Wells, 2008).

As already described above, the merger can take place in two cases: when /ɔ:/ becomes /ɑ:/ and when /ɒ/ becomes /ɑ:/.

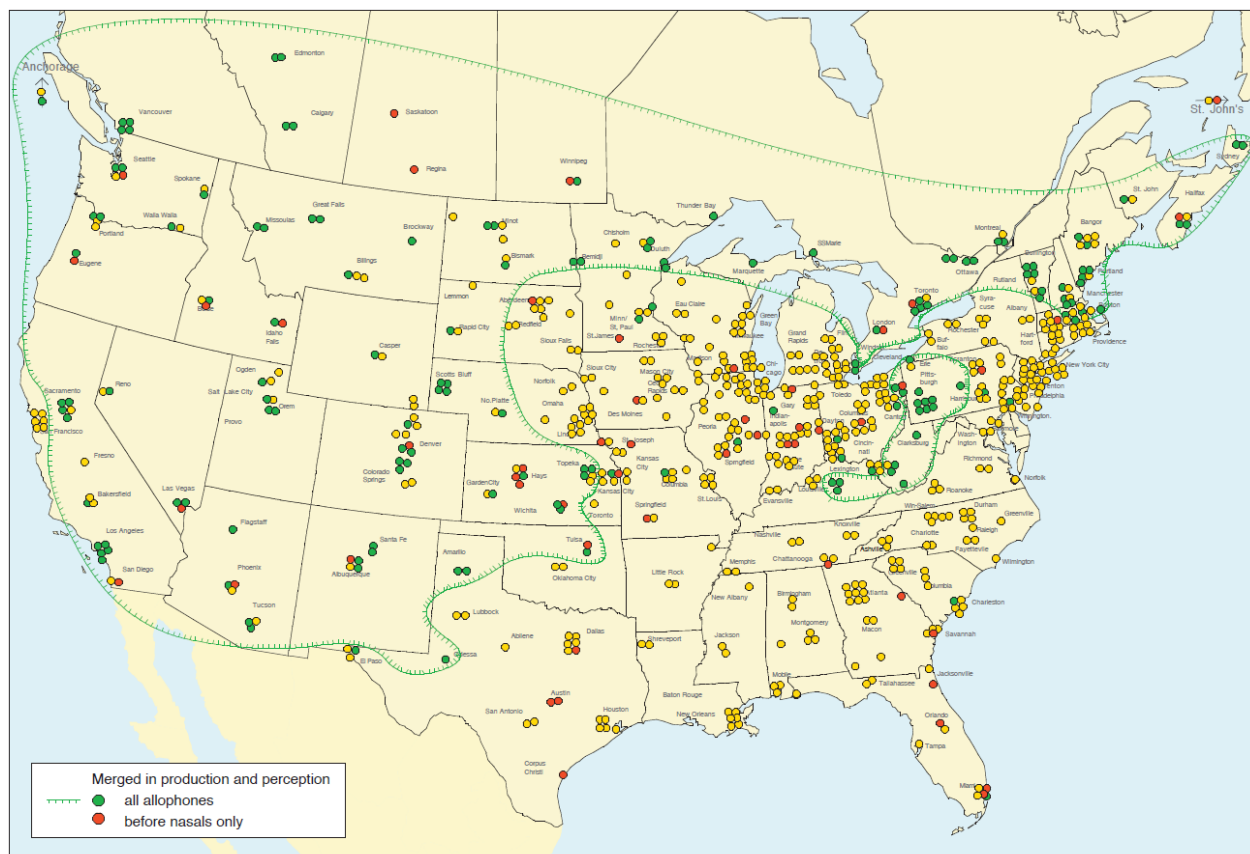
In Table 2 we can see the possible consonantal occurrences of the cot-caught merger. From an orthographic aspect, it can be clearly seen that merged vowels are mainly <o> letters and in some case <au> and only in one case <a> in the word *water*. Labov, Ash and Boberg (2005) say that the <o> and <au> variations have Old English, Old French and Middle English origins.

/p/	hop, cop	/ŋ/	Kong, song
/t/	hot, caught	/l/	Doll
/tʃ/	Scotch, debauch	/n/	don, haunt
/k/	lock, hawk	<w>	Law
/m/	bomb	/t/	water, daughter
/ð/	bother	/v/	Novel
/b/	hob, daub		
/d/	hod, sawed		
/dʒ/	lodge		
/g/	log, dog		
/f/	toff, off		
/s/	hospital, loss		
/θ/	Goth, cloth		
/ʃ/	Gosh		
/z/	positive, clause		

Table 2: Cases of the cot-caught merger (Labov, Ash, & Boberg, 2005).⁵

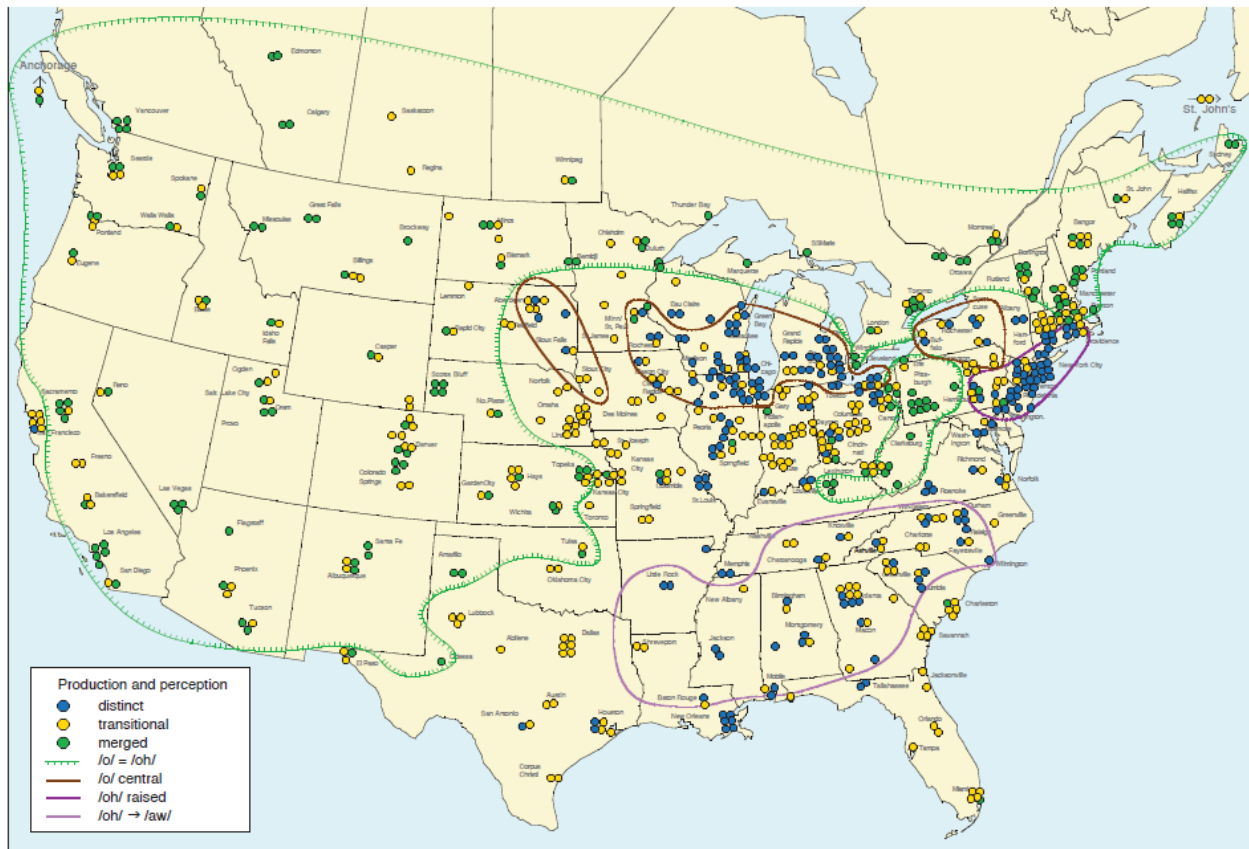
Based on what Labov, Ash and Boberg (2005) suggest the merger is the strongest in Canada, the West, Eastern New England, and western Pennsylvania. There also regions where the merger can only be heard before nasal consonants (Don vs. dawn) (Labov, Ash, & Boberg, Atlas of North American English, 2005). Map 1 shows us these data.

⁵ In Table 2 the cases of /ɔ:/ and /ɒ/ are displayed at the same time. The table was created to show which consonants can occur before the merger.



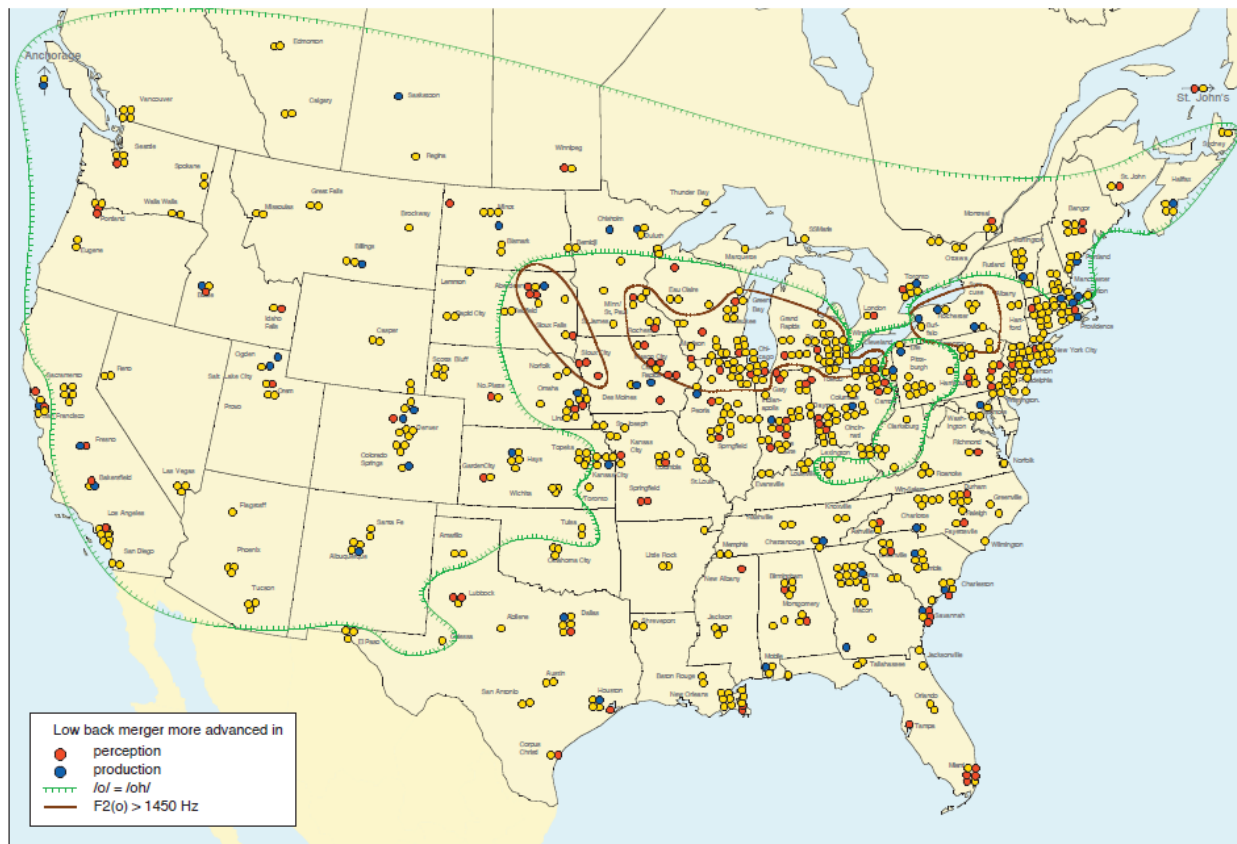
Map 1: Regional occurrences of the cot-caught merger (Labov, Ash, & Boberg, Atlas of North American English, 2005, p. 60)

Regardless of the rapid growth of the merger, there are certain dialects where the short-o and long open-o sounds have undergone other phonemic changes; therefore, preventing the cot-caught merger from developing. As Map 2 shows, these regions include the Inland North where /o/ is fronted, a strip between Baltimore and Providence on the Atlantic Coast where /oh/ is raised, and the South where there is a back upglide on /oh/ (Labov, Ash, & Boberg, Atlas of North American English, 2005).



Map 2: Areas where the cot-caught merger is retained (Labov, Ash, & Boberg, Atlas of North American English, 2005, p. 61)

The merger tends to appear first in perception than in production according to Labov, Ash and Boberg (2005).

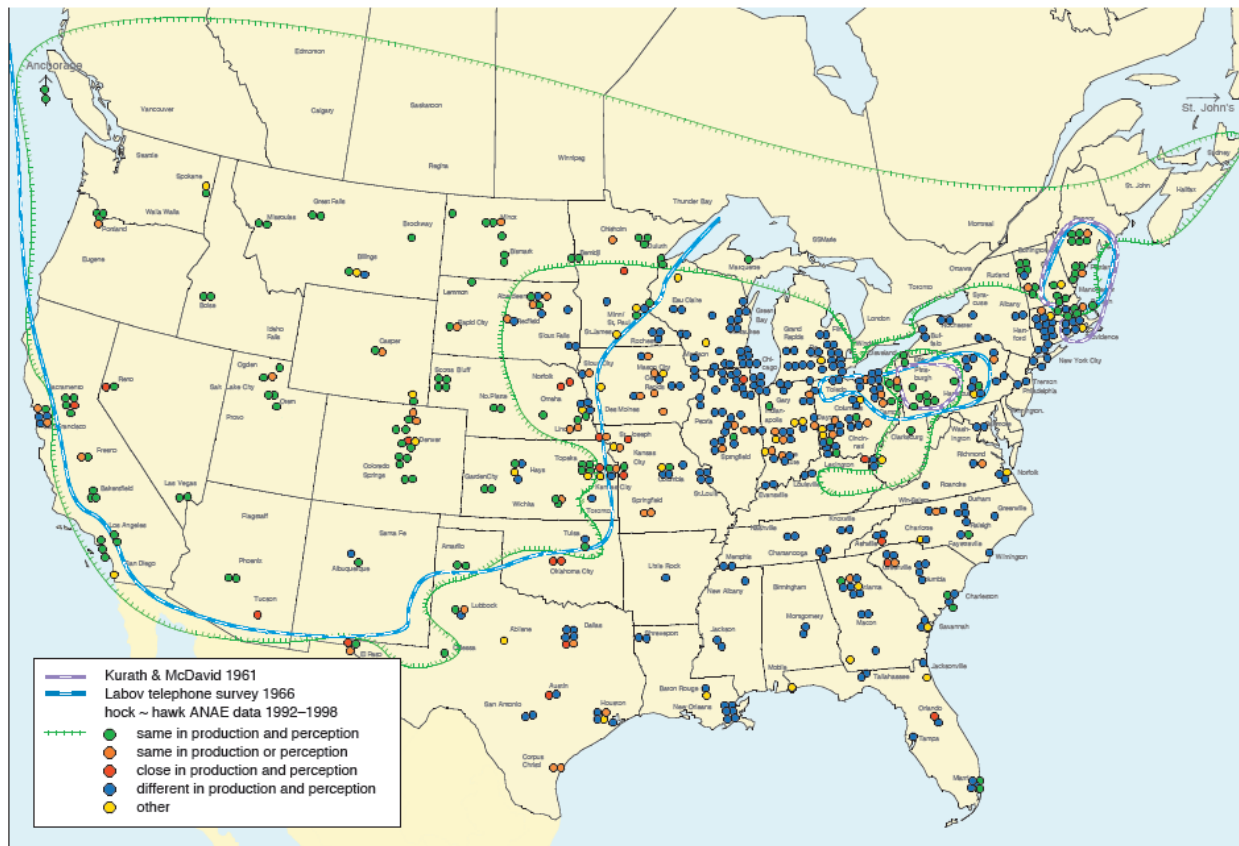


Map 3: The progression of the cot-caught merger based on perception and production (Labov, Ash, & Boberg, Atlas of North American English, 2005, p. 63)

Herold (as cited in Labov, Ash, & Boberg, 2005) reports that unmerged speakers in order to evade misunderstanding started to merge their vowels. This is one of the possible explanations for the spread of the sound change.

There are also regions where the merger is in a transitional phase. Labov, Ash and Boberg (2005) report that even in such a huge Californian city as San Francisco the sound change has not been completed. Other scholars have also observed the developing state of the merger in Texas (Bailey, Wikle, & Sand as cited in Labov, Ash, & Boberg, 2005), and other regions of the South like Charleston and Florida, Western Massachusetts and Eastern Pennsylvania (Herold as cited in Labov, Ash, & Boberg, 2005). In addition, homogeneous regions regarding the transition of the merger can be found in the Midlands.

Map 4 shows the development of the merger from the 1930s to the end of the 20th century. The data derives from several surveys conducted throughout the decades. These surveys prove the existence of the sound change and they also illustrate the movement of the merger.



Map 4: Development of the cot-caught merger throughout the 20th century (Labov, Ash, & Boberg, *Atlas of North American English*, 2005, p. 66)

2.5 The preference polls

According to Yuko Shitara's preference poll, which she produced in 1993, 63% of the correspondents realized the difference between 'cot' and 'caught' and 37% found it that it sounded the same (Figure 1).

Figure 1 also shows that 'Coffee' was pronounced with /ɑ: / by 9% and /ɔ: / by 91% of the participants and 24% said /ɑ: / and 76% said /ɔ: / in the case of the word 'gone'. It has to be noted that only those were asked who realized the unlikeness of the two sounds.

3.2. Vowels

cot and caught
coffee

sound the same 37% sound different 63%
Among those whose answered that **cot** and **caught** sounded different (Only those who did were asked to answer this question.):

gone

/ɑ: / 9%(22) /ɔ: / 91%(221)
Among those whose answered that **cot** and **caught** sounded different (Only those who did were asked to answer this question.):

/ɑ: / 24%(58) /ɔ: / 76%(184)

Figure 1: (Shitara, 1993)

If we take a look at Figure 2, we can see that the cot-caught merger rapidly emerged among the speakers, especially among those who were born after 1968. When it comes to 'coffee' and 'gone', the same rule applies (Figure 3).

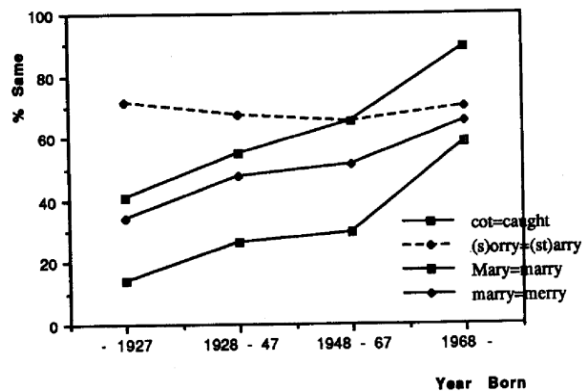


Figure 2: Age and judgement of sameness (Shitara, 1993)

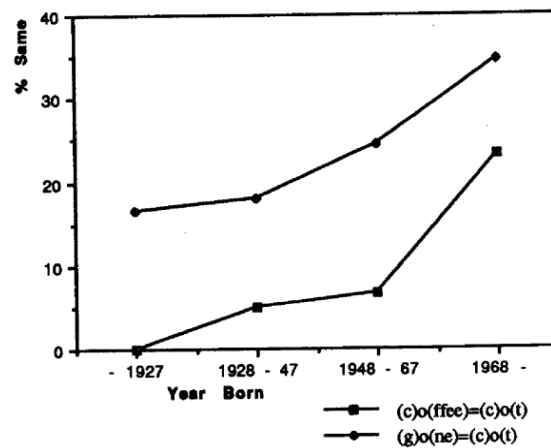


Figure 3: age and vowel choice in *coffee* and *gone* (Shitara, 1993)

In Figure 4, it is clearly seen that in the western states, the merger was the most dominant as 80% of the correspondents found that ‘cot’ and ‘caught’ were homophones.

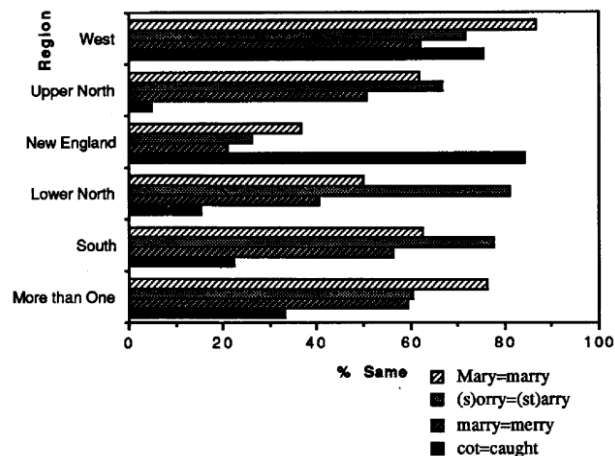


Figure 4: Region and judgment of sameness (Shitara, 1993)

The Harvard Dialect Survey was conducted by Bert Vaux and Scott Golder in 2003. Based on their work, 39.07% of the participants said ‘cot’ and ‘caught’ were the same and 60.93% realized them as different.

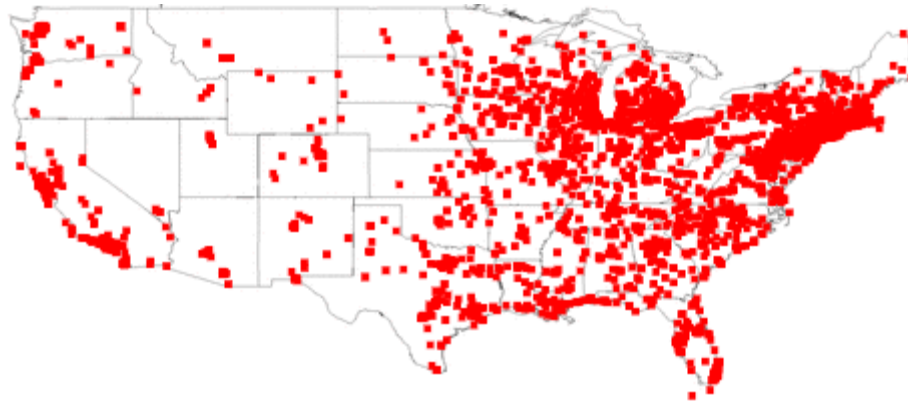


Figure 5: people who said *cot* and *caught* are different in pronunciation according to the Harvard Dialect Survey regarding the cot-caught merger (Vaux & Golder, 2003)

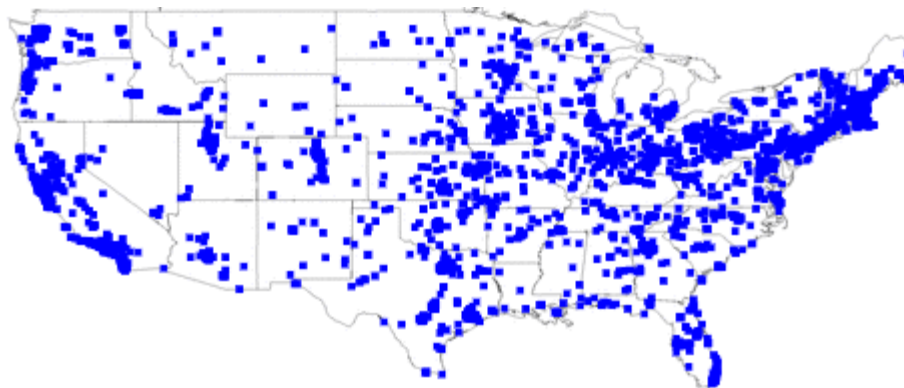


Figure 6: People who said *cot* and *caught* are the same in pronunciation according to the Harvard Dialect Survey regarding the cot-caught merger (Vaux & Golder, 2003)

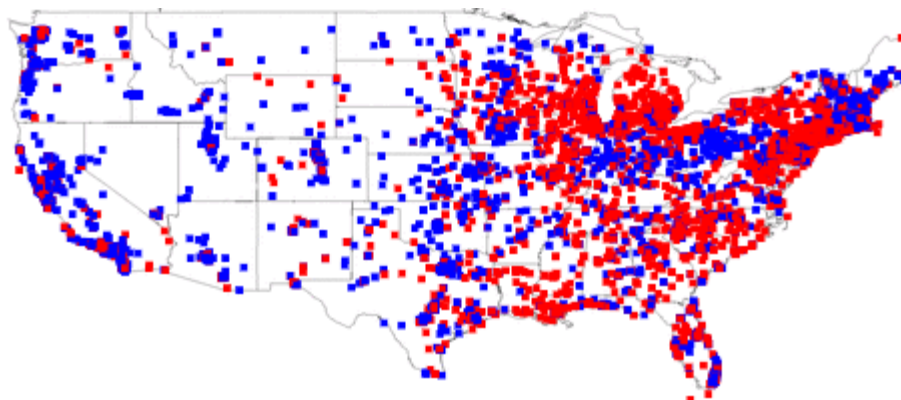


Figure 7: All results of the Harvard Dialect Survey regarding the cot-caught merger (Vaux & Golder, 2003)

The figures show that this is a 2% growth in 10 years. If one assumes that this tendency has not stopped up until 2014, then this suggests about another 2% spread; however, without further data it cannot be proved.

The cot-caught merger is one of the major characteristics of General American, but more than half of the country realized the difference between the two phonemes back in 2003, suggesting that this phonological feature is not that general as we would think it is.

Figure 7 indicates that the cot-caught merger is much more dominant on the West Coast. On the other hand, both variations of speech can be found on the East Coast. We can suppose that on one day in the future the merger will be prevalent all over the country.

3. A debate over the hypothetical changes of American accents

The recent changes of the American vernaculars are a highly controversial topic among experts. Some of them say they do change and some of them say they do not. According to Beard (2006), accents are going through a globalization process which makes them sound the same. The three major reasons for that are the media, education and social expectations.

“Regional accents are dying out...the original dialects in this country were the results of the accents of various immigrants who came to this country looking for a better life. They all landed on the east coast, which is why all accents are currently located in the east. However, as they migrated to the west, all these accents merged into one, so there are no distinctive regional dialects west or north of southern Ohio (maybe southern Illinois and a bit in northern Minnesota)” (Beard, 2006).

However, Labov (2010) questioned the validity of Robert E. Beard’s work by pointing out the following: “This overwhelmingly common opinion is simply and jarringly wrong. The research reported here will demonstrate that the reverse is actually the case. New sound changes in progress are driving the regional dialects of English further and further apart, so that people from Los Angeles, Chicago, Toronto, Philadelphia and New York speak more differently from each other than they did in the middle of the 20th century” (p. 4).

Beard responded to this statement by pointing out that in linguistics the only thing a researcher can rely on is empirical evidence, which cannot be considered as general truth. Otherwise, as he goes on, Labov also supported his own ideas with anecdotal evidences. Beard also writes about his experience during both his older and younger years regarding politics and education to support his arguments in connection with language change (Beard, 2013).

Surprisingly, the two linguists agree on the fact that regionalism in the southern states is receding (Beard, 2010) (Labov, 2013). The idea is that due to the migration of people from the northern states and the negative stereotypes hovering above the regional dialects, these dialects are disappearing. Younger generations, especially in urban areas, tend to have a much more generalized accent compared to senior citizens. Beard states that television broadcasting is also responsible for the changes occurring in the area.

4. The study

4.1 Data and collected material

The aim of this sociolinguistic study is to investigate the differences between East Coast and West Coast American English. For this purpose 26 Caucasian YouTube users between the age of 15 and 25 have been chosen as subjects. YouTube offers a series of tag videos in which users read out a couple of words which reveal phonological differences and ask questions which provide information about their region's lexicography. From the word list, which is available on YouTube, three words have been chosen to analyze. These words are *water*, *lawyer* and *caught*. In the cases of these words the cot-caught merger can be potentially exerted.

Because of the difficulty in measuring phonological differences in real-life language data, the principle of triangulation has been applied, i.e. two different methodological approaches were combined to provide more complex and reliable information (Guion, Diehl, & McDonald, 2011). The first is the judgment of three American speakers and me. Short interviews have been conducted in which the native judges were asked to decide whether they hear a rounded or an unrounded vowel sound (/ɔ/, /ɒ/ or /ɑ/). I also went through this process as a fourth interviewee.

The second angle was the Acoustic Phonetic analysis. Three vowel sounds have been analyzed and these are /ɔ/, /ɒ/ and /ɑ/. The procedure has several stages. The very first task was to select and then download the videos from YouTube. After that, the video files had to be converted into .wav file formats. In an Acoustic Phonetic analysis, frequencies (Hertz) of different sounds are measured to compare data. To know the Hertz values of the observed vowels in the cases of the three words, four computer programs have been used. The audio samples have been cut by an audio editing tool, called Soundforge. In Figure 8, we can see an excerpt of an audio file ready for editing.

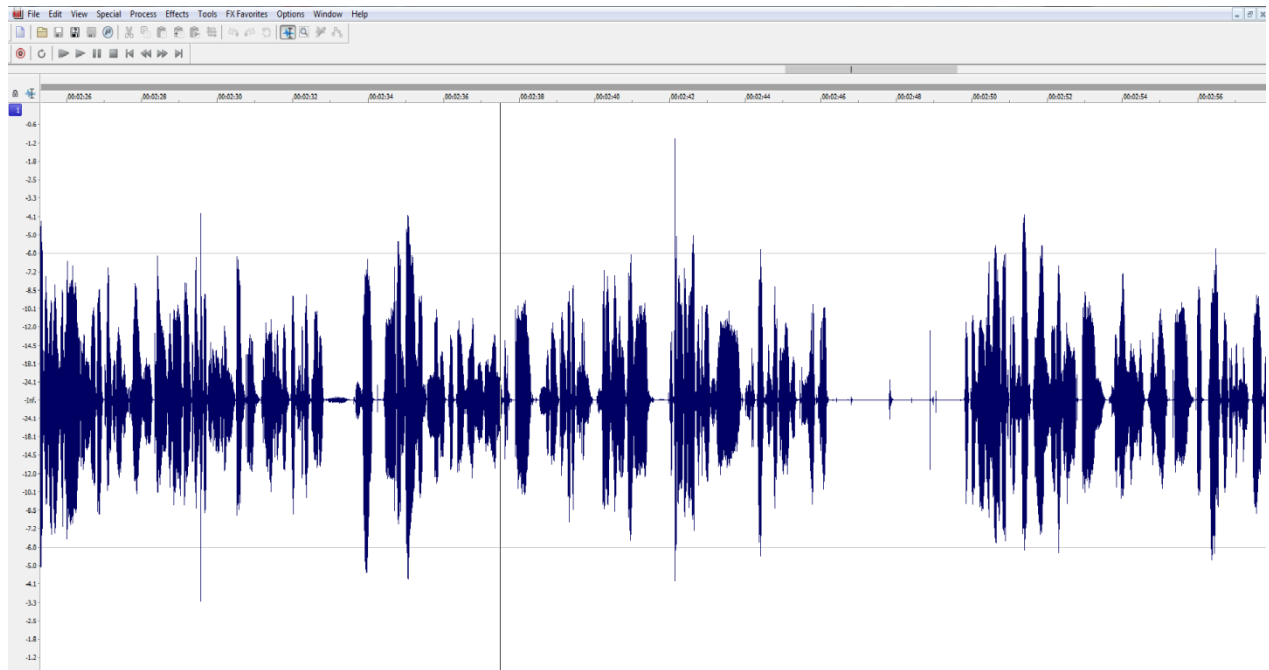


Figure 8: SoundForge

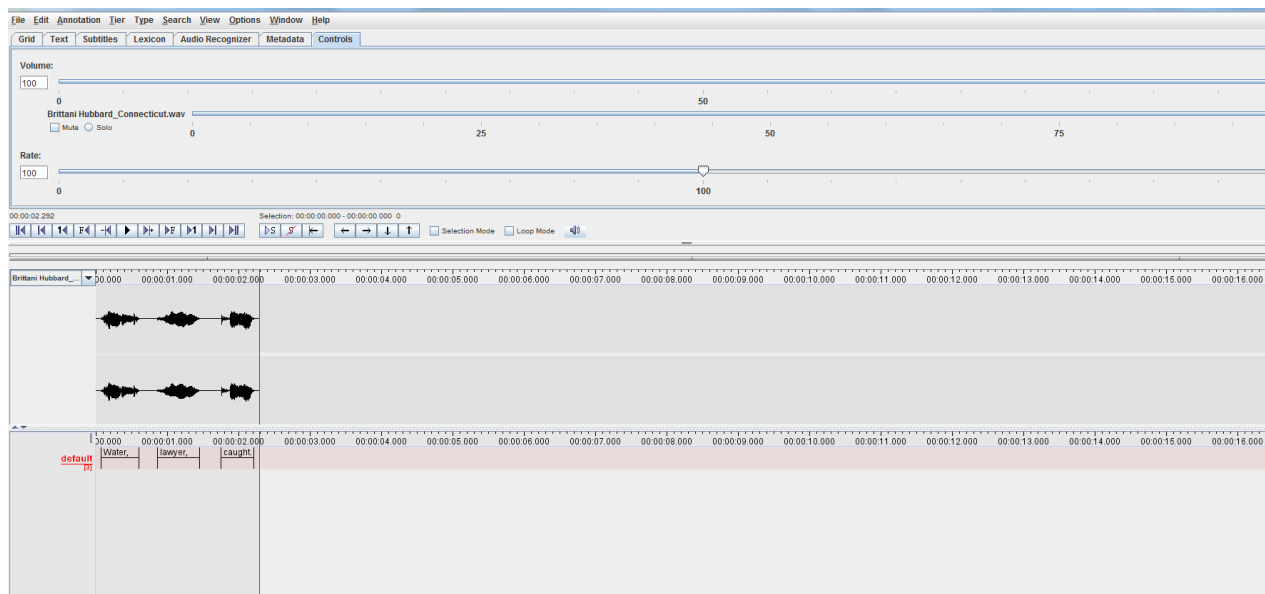


Figure 9: ELAN

After the sound files have been cut, the next step was to create an orthographic transcription in an annotation creator tool that name is ELAN, which is illustrated by Figure 9. In this figure, a completed transcription is displayed.

After the words have been properly transcribed, the transcriptions have been exported as a tab-delimited text file. The next two steps have been done by a program called FAVE (Forced Alignment & Vowel Extraction). The application has been created at the University of Pennsylvania Linguistics Lab. The program measures the sound frequency values of the vowels' formants spoken in the audio files. According to Dictionary.com a formant is "one of the regions of concentration of energy, prominent on a sound spectrogram, that collectively constitute the frequency spectrum of a speech sound." The data is produced in two steps. First, the recording with its corresponding tab-delimited text file has to be uploaded to the program's website. After receiving a Praat TextGrid file, we can commence the last step. After sending the audio record and its corresponding Praat TextGrid file, we will get back the sound frequencies of the vowels' formants. For sociolinguistic analyses, only the first and second formants of the sounds are used. The measurement point methods of the ANAE have been applied to all of the data. Based on FAVE's site, this means the measurement of the F1 (formant one) at a maximum rate. In order to compare different speakers' vowel formant values, normalized data have been used. Normalization in Acoustic Phonetics is the process of creating mean formant values. For example, a female's voice is much higher than a male's voice; therefore, mean values are ought to be used. FAVE uses the normalization procedure of Lobanov (1971). After having received the results in .txt file format, it had been opened in Microsoft Excel.

The data have been processed in two ways. First the F1 and F2 formant values have been put into scattergraphs. In these diagrams the F1 represents the horizontal axis and the F2 the vertical axis. The other method was to measure the confidence intervals of the produced data. According to Dictionary.com, confidence intervals are "the intervals bounded by confidence limits", and confidence limits, also according to Dictionary.com, "are a pair of numbers used to estimate a characteristic of a population, such that the numbers can be stated with a specified probability that the population characteristic is included between them." We were looking for these confidence limits so that we could define these specific intervals. Data has been measured by a Microsoft Excel extension called Analysis ToolPak. This add-in contains a feature, namely Descriptive Statistics, which produced the results.

Caught_ East Coast_ F1		Caught_ East Coast_ F2	
Mean	809.8462	Mean	1407.154
Standard Error	11.66292	Standard Error	50.71778
Median	813	Median	1486
Mode	835	Mode	1486
Standard Deviation	42.05125	Standard Deviation	182.8655
Sample Variance	1768.308	Sample Variance	33439.81
Kurtosis	-0.59574	Kurtosis	-1.3546
Skewness	-0.38111	Skewness	-0.4268
Range	143	Range	525
Minimum	731	Minimum	1103
Maximum	874	Maximum	1628
Sum	10528	Sum	18293
Count	13	Count	13
Confidence Level(95.0%)	25.41132	Confidence Level(95.0%)	110.5045
Caught_ West Coast_ F1		Caught_ West Coast_ F2	
Mean	815.4545	Mean	1443.818
Standard Error	17.30442	Standard Error	50.67074
Median	821	Median	1427
Mode	#N/A	Mode	#N/A
Standard Deviation	57.39227	Standard Deviation	168.0558
Sample Variance	3293.873	Sample Variance	28242.76
Kurtosis	1.135538	Kurtosis	-1.04812
Skewness	-0.39494	Skewness	0.420243
Range	219	Range	486
Minimum	697	Minimum	1234
Maximum	916	Maximum	1720
Sum	8970	Sum	15882
Count	11	Count	11
Confidence Level(95.0%)	38.55665	Confidence Level(95.0%)	112.9014

Figure 10: results for the word caught with Microsoft excel's data analysis

After that the upper bounds and the lower bounds (confidence limits), in Figure 10 minimum and maximum, have also been put into graphs. This time the horizontal axis stands for the lower bound or minimum values and the vertical axis displays the upper bound or maximum values. The given points in the diagrams have been connected in order to draw conclusions easily.

4.2 Results

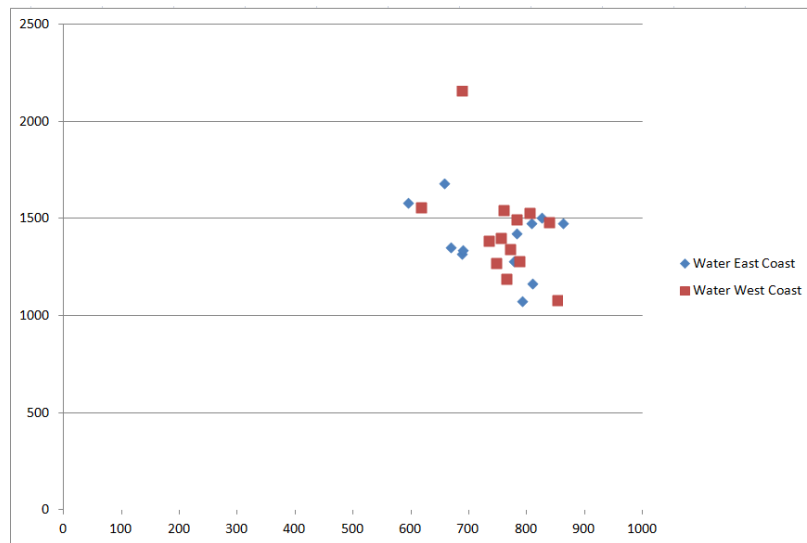
4.2.1 Listener judgments and formant values of the words *water*, *lawyer* and *caught*

Appendix 1 and Appendix 2 contain two sets of data: the judgments of the three native speakers and mine and the results of the Acoustic Phonetic analyses for the words *water*, *lawyer* and *caught*.⁶ When it comes to the evaluations, /ɑ:/ represents an open-low back unrounded vowel sound and /ɔ/ and /ɒ/ stand for an open-mid back rounded and an open-low back rounded vowel sound respectively. The reason why different symbols appear is the fact that the pronunciation of these sounds change based on what kind of consonants are near them. In this case, in the words *water* and *lawyer*, the examined phoneme is /ɔ/ and when it comes to the word *caught*, we are talking about the /ɒ/ phoneme. The judgments presented in these two tables are majority judgments. The percentages show how strong the correlation was between what the evaluators said about the vowels. It has occurred several times that the judgments were ambiguous because half of the judges identified a vowel /ɔ/ or /ɒ/ and the other half of them considered it being /ɑ:/ .

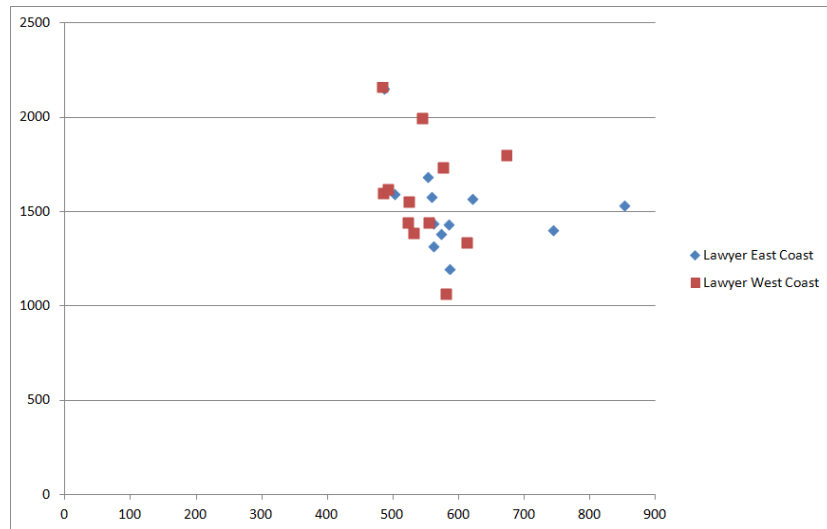
4.2.2 Scattergraphs

Each word is displayed in a different graph. The blue squares represent speakers' formant values of the East Coast and the red squares the people from the West Coast respectively. The horizontal axis stands for the F1 values and the vertical axis for the F2 values. F1 is the first formant and F2 is the second formant of each vowel sound. We measure formants in Hertz.

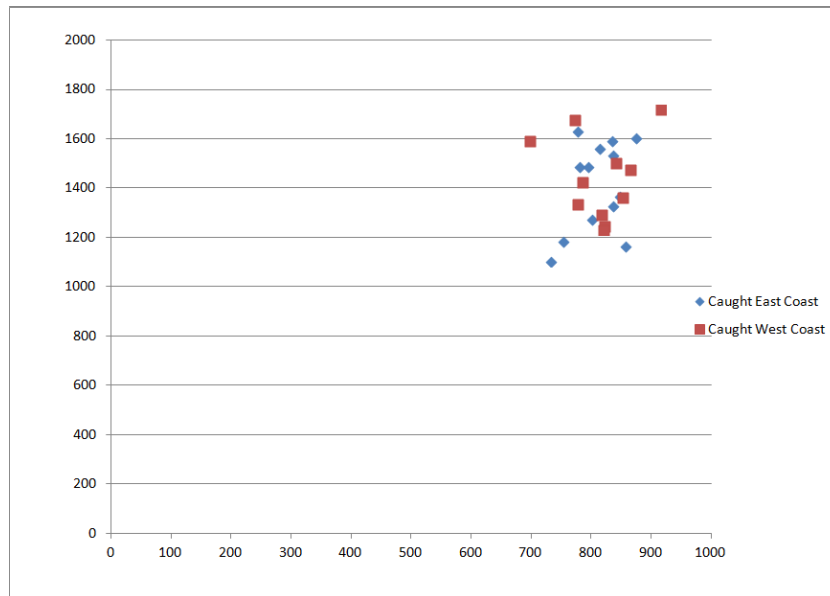
⁶ The lengths of the vowels are not displayed because it is not relevant to the study.



Graph 1: Results of *water* displayed in a scattergraph (horizontal axis: F1, Vertical axis: F2)



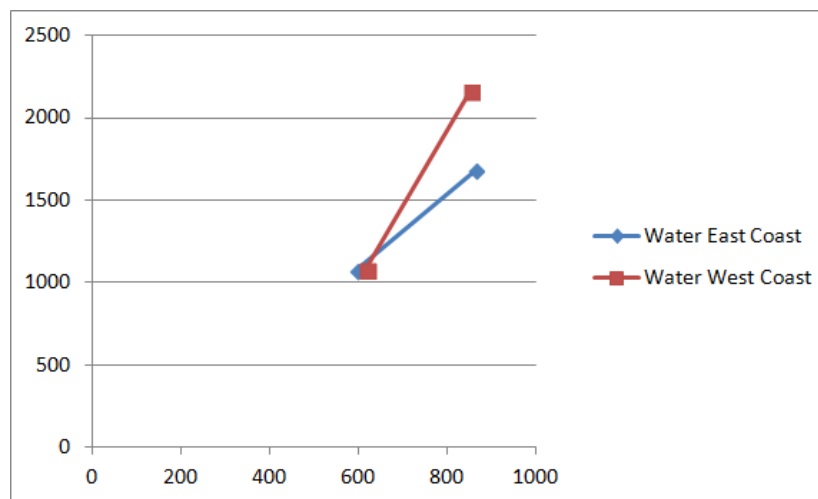
Graph 2: Results of *lawyer* displayed in a scattergraph (horizontal axis: F1, vertical axis: F2)



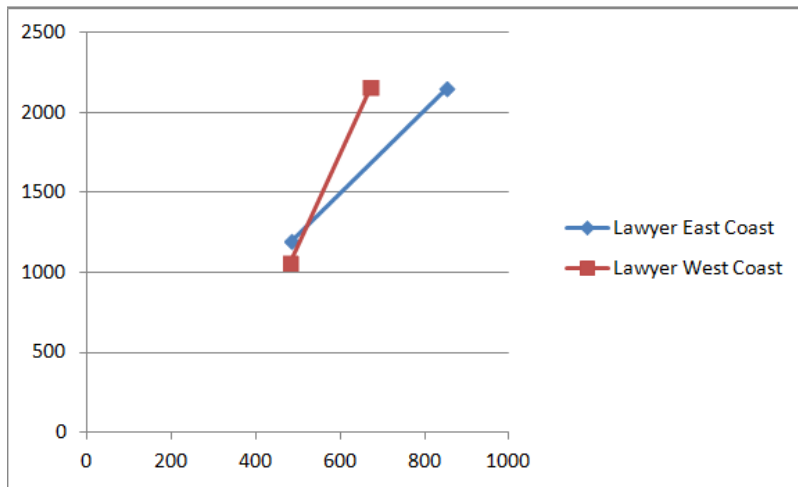
Graph 3: Results of *caught* displayed in a scattergraph (horizontal axis: F1, vertical axis: F2)

4.2.3 Confidence intervals of the words *water*, *lawyer* and *caught*

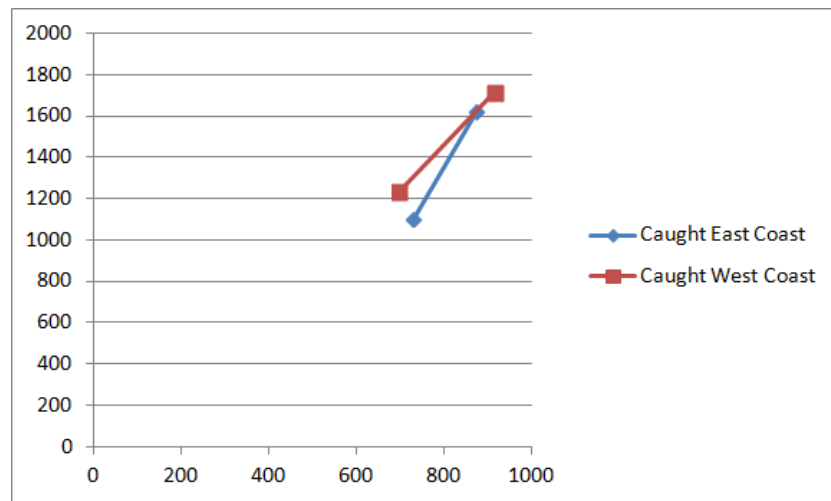
The confidence intervals' minimum and maximum values are shown in Graph 4, 5, 6 and 7 where the minimum values represent the horizontal axis and the maximum values the vertical axis.



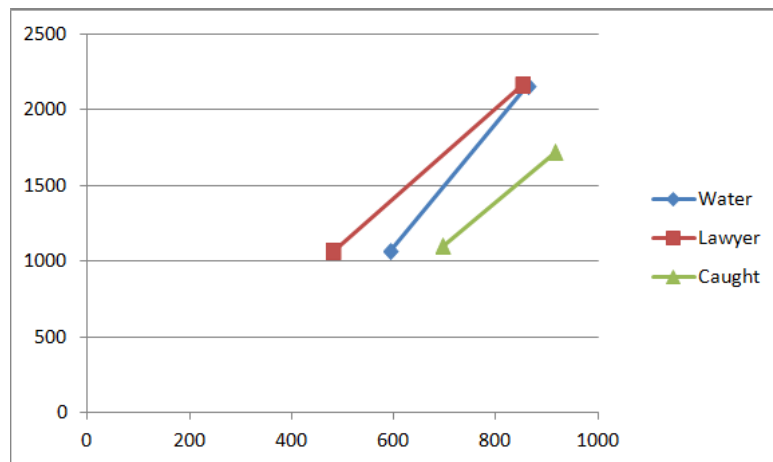
Graph 4: Confidence Interval Lines of the word *water*



Graph 5: Confidence Interval Lines of the word *lawyer*



Graph 6: Confidence Interval Lines of the word *caught*



Graph 7: The Confidence Interval Lines of the words *water*, *lawyer* and *caught* for all speakers.

4.3 Discussion

Based on the judgments of the three native speakers and I, it can be observed that concerning the overall tendency of all participants, the occurrence of the /ɑ:/ sound as a free variant is more frequent than the /ɔ/ or /ɒ/ sounds in the words *water* and *caught*. The /ɑ:/ sound was recognized 40% of the time, whereas the appearance of /ɔ/ and /ɒ/ vowels was 33%. The ambiguous cases consist of 24% of the evaluation. However, the judges showed an agreement in 64% of the cases that the word *lawyer* has been pronounced with the /ɔ/ variation. This is a phonetic phenomenon. The stem of this word is *law*, which is pronounced with /ɑ:/. /ɑ:/ is a back vowel sound; therefore, when speakers say the word *lawyer*, the vowels have to be adjusted to each other as the /ɔɪ/ diphthong is fronted. The tongue would have to change positions radically in this case, so we should pay attention to the fact that just because someone pronounced the word *lawyer* with the /ɔ/ sound; it does not mean that this particular person does not have the merger. Figure 8 has been taken from Wells's Longman Pronunciation Dictionary. The figure shows that 77% of the survey's participants pronounced this word with the /ɔ/ variation instead of otherwise.

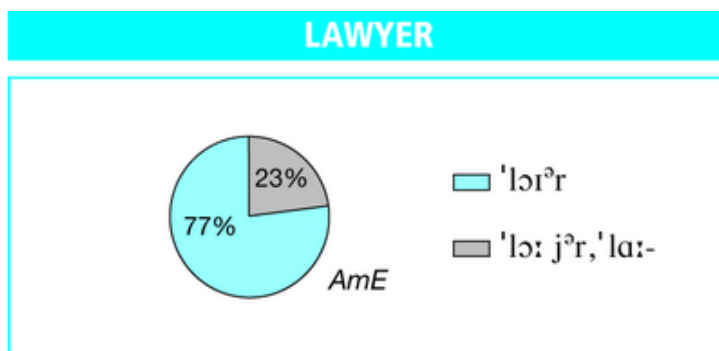


Figure 11: An American preference poll of *lawyer* (Wells, Longman Pronunciation Dictionary, 2008)

Caught has been pronounced with /ɑ:/ 72% of the time and 11% otherwise with /ɒ/. Ambiguous cases comprise 15% of the evaluations. This suggests that the merger is taking over speech variations as a very large proportion of the participants said the word with /ɑ:/.

Water is articulated with the /ɑ:/ free variant in mostly all regions except for areas in the South and the Mid-Atlantic region. Sydney Megan from Georgia, Lincoln Campbell from Virginia said the words with /ɔ/ from the South and Old Mahomies, WheelzOfFortune, vtekmonstah, Casey Smith and JvmJpe407 did the same from the Mid-Atlantic area.

There is stronger agreement in the case of the word *lawyer* when it turns to West Coast speakers compared to East Coast speakers. 91% of the evaluations suggested that *lawyer* was pronounced as /ɔ/ with a strong agreement in the speech of participants coming from the West Coast, whereas this is just 38% in the case of East Coast speakers. This suggests homogeneity of speech in those states. 46%, a very high rate, was the ratio of ambiguous cases when it comes to East Coast speakers' pronunciation of *lawyer*.

The fact that 45% of the time /ɑ:/ was strongly judged to be pronounced in *water* and 53% in *caught* in East Coast speech suggests that the cot-merger is growing and taking over.

There is no clear pattern regarding the comparison of the speakers' pronunciations and formant values, but some basic rules can be observed. The more rounded a vowel is, the higher its formants are. For example, if we take a look at Old Mahomies's formants in Appendix 1, we can see that both *water* and *lawyer* have been identified to be pronounced with /ɔ/ at the beginning of the words and the F1 and the F2 in both cases are very close to each other. Another example for this can be Britanni Hubbard, also in Appendix 1, whose formants show similar patterns, but she pronounced the examined vowels with /ɑ: / when it comes to *water* and *caught* and articulated *lawyer* with the /ɔ/ variation.

In the cases of strong agreements of more rounded vowel sounds in the word *caught*, F1 seems to be nearly always below 800 Hz.

Roundedness in the word *caught* shows similar F1 values with *water*, but the F2 of *caught* tend to be a smaller number than that of *water*.

As for the F1 and F2 values by themselves, no correlation can be identified between the phonemic variations of the people from the West Coast and the East Coast at first sight. However, if the F1 and F2 values are inserted into scattergraphs, a clearer pattern can be observed. If we take a look at Graph 1, 2 and 3, we can see bundles of points which can indicate the regions' homogeneity. The larger proportion of speakers rounding up in the same area in each graph implies the growth of the merger.

Those people whose vowels are relatively far from the others' are those who have more regional accents. This regionalism both occurs in Western and Eastern speech according to the data. Although there is a larger diversity of accents on the East Coast, the graphs seem to suggest that acoustic differences can be observed on the West Coast as well, which can mean differences in accents too. Based on the analysis, there is a smaller variation in the pronunciation of the word *water* than in *lawyer* and *caught* as the farther the points are in the scattergraphs, the more diverse variations we are going to get.

For example, more regional East Coast variations are to be found on the horizontal axis from about 770 Hz to 870 Hz and on the vertical axis between the values of 1400 Hz and 1600 Hz in the case of the word *caught* in Graph 3.

According to Graphs 4, 5 and 6 in which the results of the confidence intervals are displayed, the differences between the two regions can also be seen by displaying the data in that way. Variation in the sizes of the lines' gradients can be observed in the cases of each word's results due to vowels appearing between dissimilar consonants in the words. Although there are many differences in terms of every aspect examined above, some correlation can also be found. The facts that on the scattergraphs some blue and red points are very near or on one another and that the matched lines of the confidence intervals' upper and lower bounds cross each other indicate that there are also similarities, but quite few.

In Graph 6, the confidence interval line of *caught* seems to be distinct from *lawyer*'s and *water*'s. This shows that differences occur in lower bound values, in other words, speakers' pronunciation of the word *caught* tend to differ when it comes to the F1 value than that of the F2 value as opposed to *lawyer* and *water* where the opposite pattern can be observed: F2 values are more similar to each other than F1 values.

Confidence intervals have also been measured for each word in the cases of all speakers. Graph 7 shows that the confidence interval lines of *water* and *lawyer* cross each other on the horizontal axis at around 850 Hz and on the vertical axis at approximately 2100 Hz. However, *caught* only appears beside them. This suggests that the first vowels in *water* and *lawyer* are more likely to sound the same than that of *caught* as initial resonance occurs at approximately the same level.

5. Conclusion

The main aims of this paper are to investigate the question of sound change regarding dialects on the eastern and western coast of the United States of America, attempting to find out whether there is a difference between the pronunciations of the two coasts based on the cot-caught merger and examining the merger's development among younger generations.

In order to do that, the approach of triangulation was used, meaning that a given corpus was examined from several different angles (Guion, Diehl, & McDonald, 2011). First, the corpus was evaluated by three native speakers and me, then an Acoustic Phonetic analysis was conducted and finally by using the results of the analysis, the confidence intervals of the subjects' sound frequencies were measured.

The study provided evidence to support both Labov's and Beard's position. It justified Labov's claim in the sense that the change of American English and how certain accents evolve into something different, because just based on the spread of the cot-caught merger, dialects are taking up new shapes. The study justified that the spread of mergers change the language. Beard's statement that certain accents tend to fade away was also proved to be true since in the case of the cot-caught merger, we are indeed talking about the disappearance of speech forms as the lack of the merger is one of the major characteristics of East Coast accents.

The comparison of the two preference polls, the majority judgments, the Acoustic Phonetic analyses, the scattergraphs and the confidence interval lines suggest a clear pattern in the development of American English nowadays: differences still can be observed, even though the process of standardization has its impacts on the communities' language use.

During the study many difficulties occurred. First of all, it was challenging to find data in order to complete the acoustic analyses as the United States is far from Hungary and the university

does not have any corpora which could have been used for the study. Moreover, as YouTube videos have been used, the qualities of these samples were not the best in some cases. This also hindered the development of the examination. Again, as some of the videos had bad qualities, the audio had to be improved sometimes. Unfortunately, regardless of all efforts some vowel analyses were unsuccessful.

It has to be noted that the lack of experience in the field of linguistics can hinder the identification of sounds. Strongly regional variations are especially difficult to identify. Training the judges to identify these differences could serve as a solution.

This paper can be expanded in several ways. By applying more statistical methods, more presumptions can be made in connection with pronunciations and formant values. Even more accurate data could be produced if more speakers were analyzed with the currently used methods and the new methods as well. Original audio samples recorded for the purposes of the study could also boost the success rate of the analyses.

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Appendix 1: Majority judgments and formant values of the East Coast speakers

East Coast	Water			Lawyer			Caught		
Speaker	Judgment	Formant values		Judgment	Formant values		Judgment	Formant values	
(Hubbard, 2012)	ɑ 100 %	826	1507	ɑ/ɔ 50%	561	1439	ɑ 100 %	801	1271
(Smith, 2012)	ɑ/ɔ 50%	688	1321	ɔ 75%	485	2151	ɑ/ɔ 50%	777	1628
(Gordon, 2012)	ɑ 75 %	808	1479	ɑ/ɔ 50%	586	1198	ɑ 75 %	813	1559
(JvmJpe0407, 2012)	ɑ/ɔ 50%	810	1168	ɑ/ɔ 50%	502	1594	ɔ 75%	779	1486
(Caspersen, 2012)	ɑ 75 %	863	1478	ɑ/ɔ 50%	558	1580	ɑ 100 %	753	1182
(Campbell, 2013)	ɔ 75%	668	1355	ɑ/ɔ 50%	743	1405	ɔ 75%	794	1486
(Mahomies, 2013)	ɔ 100%	594	1584	ɔ 100%	561	1316	ɑ 75 %	874	1601
(xblackbloodangelx, 2013)	ɑ 100 %	777	1283	ɔ 75%	572	1385	ɑ 100 %	835	1533
(d'Angelo, 2011)	ɑ 100 %	689	1339	ɑ 75 %			ɑ 100 %	846	1364
(SydneyMegan, 2012)	ɔ 75%	658	1681	ɑ 75 %	852	1532	ɔ 75%	731	1103
(iSLiFE, 2012)	ɑ 100 %	783	1424	ɑ/ɔ 50%	584	1434	ɑ 100 %	835	1326
(vtekmonstah, 2011)	ɑ/ɔ 50%	792	1074	ɔ 100%	553	1687	ɑ/ɔ 50%	834	1591
(WheelzOfFortune, 2012)	ɔ 75%			ɔ 75%	621	1569	ɑ/ɔ 50%	856	1163

Appendix 2: Majority judgments and formant values of the West coast speakers

West Coast	Water			Lawyer			Caught		
Speaker	Judgment	Formant values		Judgment	Formant values		Judgment	Formant values	
(channel, 2011)	ɑ/ɔ 50%	747	1275	ɔ 100%	554	1445	ɑ 75 %	865	1477
(christison, 2013)	ɑ/ɔ 50%	617	1562	ɔ 100%	579	1066	ɑ 100 %	916	1720
(beautysoulfood, 2013)	ɑ 75 %	735	1386	ɔ 100%			ɑ 75 %	818	1296
(Cassaaaaaandra, 2013)	ɑ/ɔ 50%	689	2160	ɔ 75%	484	1604	ɑ 75 %	777	1336
(CINDAAA, 2012)	ɑ/ɔ 50%	853	1080	ɔ 75%	672	1801	ɑ 100 %		
(Harmony, 2011)	ɑ 75 %	805	1532	ɔ 100%	522	1444	ɑ 75 %	822	1248
(Joy, 2012) /Marysa/	ɑ/ɔ 50%	783	1497	ɔ 100%	491	1621	ɑ 75 %	821	1234
(Joy, 2012) /Shannon/	ɑ 75 %	756	1403	ɔ 75%	544	1997	ɑ 75 %		
(Constant, 2012)	ɑ 75 %	771	1343	ɔ 75%	482	2163	ɑ 75 %	697	1594
(pmendizabal9, 2013)	ɑ 75 %	787	1285	ɑ/ɔ 50%	523	1554	ɑ 75 %	773	1681
(teslinclare, 2012)	ɔ 75%	765	1193	ɔ 100%	575	1736	ɑ 75 %	853	1364
(Shan, 2011)	ɔ 75%	760	1544	ɔ 100%	611	1339	ɑ 100 %	842	1505
(MUA, 2012)	ɔ 75%	839	1484	ɔ 100%	530	1388	ɑ/ɔ 50%	786	1427