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THE DIFFERENTIAL IMPACT OF LANGUAGE SKILLS ON THE WAGES OF HISPANIC MEN AND WOMEN

by

Annette Marie Tanori

Bachelor of Science, Business Administration
University of Arizona
1998

A thesis submitted in partial fulfillment
of the requirements for the

Master of Arts Degree in Economics
Department of Economics
College of Business Administration

Graduate College
University of Nevada, Las Vegas
May 2005

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ABSTRACT

Differential Impact of Languages Skills on Hispanic Men and Women

By

Annette Marie Tanori

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This study will look to expand on the work that has been done in regards to the earnings of Hispanics. When compared to other minority groups, Hispanics traditionally earn less. The average household income for Hispanics is 22% less than the national average household income of $42,000 a year. This study will examine the effect that the language penalty, which is the estimated difference in wages between English and non-English speakers holding other important factors constant, has on the earnings of Hispanic men and women. The data used in the study is taken from the United States Census Bureau, 2000 Census of Population and Housing, Public Use Microdata Sample (PUMS) for the state of Nevada. By building upon theories of human capital, investments in education and the general earnings function, the study develops several models which capture the impact that the language penalty has on the wages of Hispanic men and women.

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CHAPTER 1

INTRODUCTION

The Hispanic population became the largest minority group in the United States in 2003, surpassing African-Americans. There are over 39 million individuals that claim Hispanic ancestry, of which over 8 million are illegal immigrants (Grow, 2004). The U.S. Census (2003) reports that approximately 400,000 people emigrate from Latin American countries a year, the largest numbers in United States' history. With such large numbers, many people are beginning to take notice of Hispanics and the role they play in the American economy. Even mainstream America is beginning to court Hispanics, whose disposable income grew to an astonishing 29% since 2001 to over $652 billion dollars in 2003. (Grow, 2004).

Despite the large growth in numbers, however, Hispanics still earn less than other minority and immigrant groups. In fact, while the average household's income is $42,000 a year, the average Hispanic household earns only $32,000 per year, 78% of the average. Researchers have examined a wide variety of possible reasons for the difference in earnings. These works examine for example, the effects reading proficiency and discrimination practices have on Hispanic earnings. Using data from the United States Census Bureau, 2000 Census of Population and Housing, Public Use Microdata Sample (PUMS) for Nevada, this study examines the impact that English proficiency has on

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wages of Hispanic men and women. By using the general earnings function developed by Jacob Mincer (1970) that incorporates the theories of human capital and investment in education, I will build three models that capture the effect poor English skills have on the wages of Hispanic men and women.

The first model examines the influence that language skills have on Hispanic wages. The second model examines the differential impact language skills have on the hourly wages of Hispanic men and women. Finally, a third model examines whether the language penalty is affected by the percentage of Spanish-speaking workers in a neighborhood. It is hypothesized that poor English skills do not have as great an effect on wages of Hispanics who live and work in neighborhoods that predominately speak Spanish. To capture this aspect of the data, I include the percentage of Spanish-speakers that reside in a Public Use Microdata Areas (PUMAs) in the regressions.

The results from each model are consistent with the findings of past research. I find that poor English proficiency has a significant impact on the wages of Hispanics. The data suggest that a language penalty, as measured by the effect English proficiency has on wages, exists for both men and women. The results indicate, however, that the language penalty is more severe for women. The data also show that the language penalty is less severe for Hispanic men who reside in largely Spanish-speaking neighborhoods. The findings suggest that the neighborhood effects do not affect female wages.

The remainder of the paper is organized in the following manner. Chapter two summarizes the literature on language skills and Hispanic wages. Chapter three presents a framework for the empirical analysis. Chapter four discusses the data, chapter five

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presents the results, chapter six ties up the study with conclusions and suggestions for future research.

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CHAPTER 2

LITERATURE REVIEW

The lower wages of Hispanics result in higher social costs for the rest of society. When individuals do not earn enough to take care of themselves and their households, society as a whole bears the burden associated with social programs designed to help support low income families. The recent growth in the Hispanic population, and the fact that Hispanics earn lower wages, makes it worthwhile to examine the impact Hispanics have on American society and the economy. Past studies on Hispanic wages have concentrated primarily on the relationship between country of birth, education, time of immigration, health, marriage status, ethnicity, age, and English language skills to explain the wages of Hispanic men and women, and why they fall short of other groups.

English Proficiency

McManus, Gould, and Welch (1983) examine how language characteristics affect wages. They consider traditional characteristics, such as country of origin, immigration, race, but also include a variable for English language deficiency to examine the influence language skills have on wages. The study concludes that when the variable measuring English-language deficiency is omitted from the model, the variables for ethnicity, age, education, and languages spoken have a statistically significant impact on the wages of

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Hispanic men. The authors conclude that these traditional characteristics have the same affect on wages as the inability to speak English. McManus, Gould, and Welch argue that the inability to speak English is highly correlated with ethnicity, county of birth, immigration, and education. Overall, McManus, Gould, and Welch conclude that Hispanic men receive lower wages when compared with other minority groups and Anglo men. They also conclude that poor English proficiency and limited education play a larger role in regards to the lower wages of Hispanics than has been indicated by past research.

Grenier (1984) explores models of discrimination based on imperfect information and the human capital theory, which have been used to explain the relatively low wages of Hispanic men. Grenier builds on past research by examining the relationship between language skills and the theory of human capital. Grenier predicts that poor language skills are actually a better indicator of lower Hispanic wages than discrimination and imperfect information. Grenier concludes that the "wage differential between whites and Hispanics is entirely accounted for by difference in education and language endowments (Grenier, pg.51)." Hispanics who speak Spanish as their primary language have lower returns to education than Hispanics who speak English. Grenier also concludes that language attributes explain up to one-third of the wage differential between whites and Hispanics.

Chiswick (1991) offers an alternative method to examine the impact English proficiency has on Hispanic wages by evaluating the influence that reading ability has on labor market earnings. Chiswick includes variables not considered by others. His work attempts to examine the characteristics that to determine English fluency and how these characteristics translate into labor market earnings. With regards to reading ability, the

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study concludes that aptitude is related to the participant's overall skill level. Those with more schooling in the United States have a higher level of ability than those who studied abroad. The longer immigrants stay in the U.S., the greater their reading skills. In regards to earnings, the study finds that reading ability has a positive effect on earnings and is more important in explaining wages than language skills. Overall reading well can increase earnings by 31%. Chiswick's study differs from others because it is the first to consider the importance of reading skills. While emphasis has traditionally been place on speaking skills, Chiswick's study shows the benefits of programs that strengthen both speaking and reading skills may be greater than programs that concentrate on only speaking skills.

Kim (2003) studies the impact of English language proficiency (ELP) on Hispanic earnings. Kim argues that as the gap between skilled and unskilled employees widens, as a result of technological development, ELP is increasingly more important for Hispanics. Kim examines the patterns between educational attainment, labor market returns, and the earnings of Mexican Americans with different levels of English proficiency. Kim expands on past research by using nativity and its relationship to ELP to explain the earnings of Mexican American employees. Kim finds that educational attainment is a significant predictor of earnings, but its impact is greater for those proficient in English than those who are not. For proficient employees, an additional year of education increase earnings by 1.5 %, by comparison, non-proficient employees experience only a 0.8% increase in earnings with an additional year of school. Years of work experience also benefit proficient employees more, with an additional year of experience increasing earnings by 1.4 %, while non-proficient employees experience only a 0.69% increase.

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Overall, the study concludes that, while the relationship between English language proficiency and education attainment is unknown, ELP and education are complements that have a positive impact earnings. Kim concludes that poor English language skills have a larger impact on immigrants than Hispanics who are native to the United States. Immigrants, with limited language skills, find it more difficult to advance their education, and, therefore, are more likely to earn lower wages.

Mora (2003) stresses that, while there has been a great deal of literature devoted to examining the issue of ELP and it's influence on the U.S. job market, nearly all the current published research relies on data sets that are at least a decade old. Mora attempts to update the research using data from the 1% Public Use Microdata Sample (PUMS) from the 2000 Census. Mora builds on the theories of human capital and communication skills, stressing that good English language skills increase productivity and wages. The study finds that earnings of Hispanic men increase with English proficiency. For women, however, there is no statistical difference in the language penalty between those who do not speak English well and those that do not speak English at all. The study also considers the impact of English language skills on other job skills and finds that among employees with no education or experience, those who speak English poorly earn significantly less than those who speak English well. Mora also finds that poor English skills reduce the returns to education. For example, Hispanics with 10 years of schooling, who speak English poorly, earn 18% less than their peers who speak English.

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Immigrants versus Non-Immigrants

George Borjas (1982) maintains that the Hispanic population is not as homogenous as many would like to believe. One of the most distinctive characteristics among Hispanics is whether or not they immigrated to the United States. Borjas focuses on immigration status and the impact it has on the earning potential of Hispanic males. Borjas finds that Hispanic immigrants have adapted very well to the U.S. economy. The findings show that wages are positively related with the amount of time that has passed since immigration. The rate at which wages respond to the assimilation process, however, differs among Hispanics. The study finds that Cuban immigrants, who are often political refugees, assimilate into the work force quicker than other Hispanics, and finds that Cubans accumulate more human capital than other Hispanics during their stay in the United States. These results support Borjas' theory that political refugees have more incentive to adapt to the work force, and do so by investing more time into their job skills than economic refugees. This investment in human capital is translated into higher wages.

Park (1999) determines English proficiency is an important determinant for the earnings of immigrants in the United States. Park explains that while many studies find that English ability is an important factor in determining the earnings of immigrants, other studies conclude English language skills do not immigrant's earnings. Park evaluates the impact English proficiency has on returns to education and on experience obtained before and after migration to the U.S. This study views language skills as an investment in human capital. The author hypothesis that immigrants with limited language skills will have a steeper earning profile than immigrants who are proficient in English because they will investment more in their human capital. Park argues that the

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steeper earnings profile for non-English immigrants supports the theory that English skills are important in determining the earnings of immigrants versus non-immigrants.

Park's results indicate that language proficiency, for immigrants, is valuable because it facilitates the transfer to the U.S. labor market of education and experience obtained abroad. The ability to transfer these skills results in higher wages for immigrants who speak English. The lack of English ability, however, appears to cancel out any skills immigrants may have obtained in their home countries. Park concludes that English proficiency plays a larger role in determining the wages of immigrants than work experience, education, and job skills. Thus, those who lack language ability, even with experience and education, earn lower wages.

Earnings across Generations

Trejo (2001) examines the wages of Hispanics across the generations. This study examines how the wages and human capital of Mexican workers changes as families spend more time in the United States. Trejo identifies three generational categories. The first generation consists of foreign-born individuals, whose parents were also born outside of the U.S. The second generation consists of U.S. born individuals who have at least one foreign-born parent. The third generation includes U.S. natives whose parents are also natives. Using these categories, Trejo compares the wages of first, second, and third generation Mexican and white men.

The results of the study suggest that U.S. born Mexican-Americans have a considerable earnings advantage over Mexican immigrants. The difference in wages is not only a function of intergenerational improvements in education and English

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proficiency, but also represents returns from investments in human capital for Mexican workers who are born and receive their schooling in the U.S. Surprisingly, Trejo finds that American-born Mexicans earn higher wage that immigrants who migrated to the U.S. 40 years ago. Trejo concludes that there is a considerable increase in earnings between the first and second generations and America-born Mexicans reap the rewards from the hard work of their grand-parents and parents. Comparing Mexican and white workers, Trejo discovers that Mexicans earn lower wages than white males. The deficit in wages grew from 24% in 1979 to over 32% in 1989. In regards to generational changes, changes in the wage structure takes longer to play out for Mexicans than for whites. For example, third generation Mexicans earn 24% less than third generation whites. Overall, Trejo concludes that it takes Mexicans three generations before they achieve the returns to education and wages that are enjoyed by American-born whites.

Earnings of Hispanic Women

Carlson (1998) analyzes the earnings gap between men and women to show how characteristics contribute to differences in wages among twelve different Hispanic groups. Carlson finds that Mexican and Puerto Rican women earn less than Anglo women, because Hispanic women have less education and work fewer hours than other groups of women. Hispanic women also have a smaller percentage of their population in the work force. Overall, Carlson finds that while the male-female wage gap fell between 1969 and 1979, women of every ethnic group earned less than similar white and minority men.

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McLaffery and Preston (1992) recognized that past research has largely ignored Hispanic women when examining Hispanic employment and earnings. McLaffery and Preston revisit the spatial mismatch hypothesis, which theorizes that the lower wages of minorities can be attributed to the fact that many urban cities have shifted their focus away from the manufacturing sector to an information and service driven economy. This change in focus leads to a mismatch between the skills required for employment and the skills offered by potential employees. Minorities, who often depend on manufacturing industries to earn their livings, have suffered the most from the shift to a service economy. This study examines how spatial mismatch influences the earnings of African-American and Hispanic women.

McLafferty and Preston find that Hispanic women earn the lowest median wage when compared to African-Americans and men. There is little evidence found, however, linking spatial mismatch to the lower wages of Hispanic women. The lower earnings of Hispanic women are rooted in the geographic distribution of jobs. Since Hispanic females earn the lowest wages of all minority women, there is very little incentive for them to commute to find employment. Moreover, when Hispanic women decide to work, they tend to stay close to home, preferring not to venture far outside of their neighborhoods. Overall, Hispanic women, more than any other minority group, tend to take lower paying jobs with poor earnings potential.

Woods (2000) examines the earnings of Hispanic women, focusing on the earnings differential between whites and Hispanics between 1970 and 1995. She examines how relative earnings have changed over time and whether these changes can be attributed to discrimination. Woods finds that any reduction in earnings, due to

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discrimination, has declined dramatically for Hispanics since the early 1970's, especially for Hispanic males. By comparison, Woods finds that the effect discrimination has on earnings has not changed significantly for white females during this time period. Woods concludes that labor market discrimination is much more costly for Hispanics and white women than Hispanic males.

In regards to the impact of individual skill sets have on earnings, Woods finds the gap in wages, due to skill differentials, has not changed significantly. Woods finds that whites continue to increase their education levels between 1970 and 1995, while the lever of education for Hispanics has remained relatively constant. Additionally Hispanic immigrants are more likely to be less educated compared to white and Hispanics already living in the U.S. These factors contribute to the difference in skills sets between whites and Hispanics, translating into a wage differential between these two groups.

Workplace Segregation

Hellerstein and Neumark (2002) study the role of segmentation, according to ethnicity and English language skills, and their impact on the earnings of white and Hispanic men. Hellerstein and Neumark argue that the lower wages of blacks, women, and Hispanics are, in part, attributable to a lack of communication skills. Individuals with limited or poor English language skills find it difficult to assimilate and do well in the work place, if they find employment at all. The lack of universal English skills can lead to segregation into largely all white work places, all Hispanic, or all individuals who are proficient in the English language.

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Hellerstein and Neumark find segmentation in the work environment is driven by English proficiency and Hispanic ethnicity. They find that, on average, 43.8% of Hispanic men have Hispanic co-workers, in comparison to white men who typically work with only 10% Hispanics. Hellerstein and Neumark (2002) find that the average number of Hispanics in the work place rises as English proficiency drops. For example, Hispanics who speak English poorly, on average, have a work environment that is 70.1% Hispanic, while those who speak English well have a workplace that is only 36.7% Hispanic. The study also finds that Hispanics are more likely to work with people who are less educated. This situation is exacerbated for Hispanics with poor English language skills. Overall, the study concludes that Hispanic males, when compared to white males, experience lower wages when employed in a largely Hispanic environment. Wages are decreased even further for Hispanics if the workplace consists of primarily co-workers with limited English language skills.

Past studies show that there is wide variety of ways to examine the relationship between English language proficiency and the earnings of Hispanics. Research shows that English language skills overshadow all other personal characteristics and have a greater impact on wages than education, ethnicity, or citizenship. Building upon past research I develop a model that further examines the impact English language proficiency, gender, and residing in a Spanish-speaking neighborhood has on the wages of Hispanic men and women.

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CHAPTER 3

EMPIRICAL ANALYSIS FRAMEWORK

Language skills have an important impact on communication in the workplace and, in turn, affect a worker's marginal productivity. Profit maximizing firms continue to employ labor to the point where the marginal revenue gained from hiring an additional employee equals the marginal cost of hiring labor. The labor level that maximizes profit is the one where the marginal cost of labor equals the marginal revenue associated with hiring additional labor. The marginal revenue received from hiring additional labor is referred to as the marginal revenue product of labor (MRP_L). The MRP_L is equal to the product of MP_L, which is the additional output that a firm generates by hiring an additional unit of labor, holding all other factors constant, and the marginal revenue (MR) the firm receives in the output market, that is,

$$MRP_L = (MP_L) \times (MR) \quad (1)$$

Assuming firms operate in perfectly competitive markets, where price does not vary with level of output, MR equals the price (P) of the firm's product. In this setting, a MRP_L equals the product of price and MP_L.

$$MRP_L = (MP_L) \times P \quad (2)$$

The firm's profit-maximizing level of labor can be restated in an alternative way by

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dividing both sides of the above equation by the firm's price, real wage is equal to the MP_L:

$$MP_L=W/P \quad (3)$$

Since the marginal product of labor is measured "as the units of added output per unit of increase labor, the real wage that the firm pays, its money wage divided by its price level (W/P) also has the dimension of units of output per unit of labor (Auerbach and Kotlikoff, 1998, p. 60)." Given these parameters, firms should hire additional labor up to the point where the marginal product of labor equals the real wage.

Workers play an active role in the determination of their wages. For example, workers investments in human capital affect marginal productivity, which affects wages. Human capital includes investments in education, training, migration and skills, such as English ability. Mincer's (1970) general earnings function incorporates post-school investments in human capital, such as job training or improvement in language skills. The model captures the notion that people continue to invest in human capital as long as the cost of the investment is less than the present value of the increase in earnings the investment generates. Demands for improvements in human capital are positively related to the increase in earnings that workers believe they will receive over their lifetime. In turn, the value of human capital is derived from the amount improved skills increase earnings, because workers with stronger skill sets make a greater contribution to productivity and firms are willing to pay them higher wages.

Mincer's theory can be used to explain how investment in language skills can affect Hispanic wages. Although Hispanics may not always decide to invest directly in a formal education, they still make important investments in human capital, namely by

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investing in English language ability. Poor language skills can significantly reduce one's productivity. Workers who do not speak English proficiently may be unable to communicate with their co-workers or read important instructions needed to maintain safety standards. Poor English skills are, therefore, likely to reduce a worker's productivity, resulting in lower wages. Investments in language skills have a positive affect on a worker's marginal productivity. Good English skills allow a worker to function more efficiently in the work place, simply by allowing them to communicate with the people around them. For many firms, English language ability is a basic requirement for employment.

A basic model enables me to examine the impact that the language penalty has on Hispanic wages.[1] The language penalty, for purposes of this study, is defined as the estimated difference in wages between English and non-English speakers, holding other important factors constant. The regression model estimated is the following:

$$\ln(W)_i = \alpha_0 + \alpha_1 No\ English_i + \beta X_i + \varepsilon_i \qquad (4)$$

The dependent variable in the model is the natural log of the hourly wage. The variable for *No English* is set equal to one for individuals who report they speak English poorly or not at all. While α_0 is the constant intercept, X is a vector of variables that impact earnings, β is the corresponding vector of coefficients, ε is a random error term whose value is based on an underlying probability distribution, and i indexes observations. The coefficient on the *No English* variable is used to estimate the language penalty for non-English speaking Hispanics.

[1] Language Penalty will be adjusted according to equation 14.

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To interpret the impact the estimated coefficient for the *No English* variable has on wages it is helpful to express the coefficient as a percentage. The following equations lay out the steps that must be taken to convert the estimated coefficient into a percentage. The basic wage equation is expressed by the following:

$$\ln(W) = \alpha + \delta\, No\ English \tag{5}$$

If the *No English* variable is set equal to one, the model takes on the following form:

$$E(\ln(W) \mid No\ English = 1) = \alpha + \delta \tag{6}$$

When the *No English* variable is equal to zero the equation is the following:

$$E(\ln(W) \mid No\ English = 0) = \alpha \tag{7}$$

The subtraction of equation seven from six results in:

$$(\ln(W) \mid No\ English = 1) - (\ln(W) \mid No\ English = 0) = \delta \tag{8}$$

Using the rule of log results in the following equations:

$$(\ln(W) \mid No\ English = 1) / (\ln(W) \mid NoEnglish = 0) = \ln(w_1 / w_0) = \delta \tag{9}$$

$$\ln(w_1 / w_0) = \delta \tag{10}$$

The exponential function is then taken on both sides of the equation:

$$\exp(\ln(w_1 / w_0)) = \exp(\delta) \tag{11}$$

$$w_1 / w_o = \exp(\delta) \tag{12}$$

The expression of wages as a percentage change is captured in the following equation:

$$Wages\ (as\ \%\ change) = (w_1 / w_0) - 1 \tag{13}$$

Equation twelve is then substituted into equation thirteen:

$$Language\ Penalty = \exp(\delta) - 1 \tag{14}$$

Equation fourteen measures the language penalty, as the percentage difference in wages between Hispanics who do not speak English well and those that do. The remainder of

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this study uses equation 14 to evaluate how the language penalty varies for Hispanics with different characteristics.

Past research on Hispanic wages has primarily focused on the earnings of Hispanic men versus other minority groups and whites.[2] Little consideration, however, has been given to the differences between the earnings of Hispanic men and women. Traditionally, men support households financially in Hispanic households while the women are the homemakers and do not work outside the home. The role of Hispanic women has changed recently, with more women joining the workforce. Past studies find that Hispanic women earn less than their male counterparts.[3] These differences in earnings are attributed to the fact that Hispanic women usually have less education, work fewer hours, and have a smaller percentage of their population in the work force compared to African-American and white women.

Adding additional interaction variables to the basic model enables a comparison of the effect language skills have on the wages of Hispanic men and women. Two interaction variables are created. The female education variable is produced by multiplying the *Female* variable and the variable for *High School Graduate*. Introducing this education variable into the specification allows the model to take into consideration the returns that Hispanic men and women receive from education. The second interaction variable is created by multiplying the *Female* variable by the *No English* variable. The *Female-Language* interaction variable is used to capture the difference poor language skills have on the wages of Hispanic men and women.

---

[2] Borjas, George. "The Earnings of Male Hispanic Immigrants in the United States." *Industrial and Labor Relation Review*. Vol.35-3, April 1985, pp. 343-353.

[3] McLafferty, Sara,"Spatial Mismatch & Labor Market Segmentation for Women" *Economic Geography*, Vol. 68-4, Oct. 1992

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The specification of the model with the inclusion of the *Female-Language* interaction variable is expressed in the following:

$$\ln(W) = \alpha_0 + \alpha_1 No\ English + \alpha_f No\ English * (Female) \quad (15)$$

The use of the interaction variable results in two different sets of equations, one for women and the other for men. When the interaction variable is used in the model restricted to women only it results in the following equations:

$$(\ln(W) \mid No\ English = 1 \mid Female = 1) = \alpha_0 + \alpha_1 + \alpha_f \quad (16)$$

$$(\ln(W) \mid No\ English = 0 \mid Female = 1) = \alpha_0 \quad (17)$$

Therefore the subtraction of equation 17 from equation 16 leads to the calculation of the language penalty for Hispanic women. The impact of the *Female-Language* interaction variable is measured by adding the coefficient on the *No English*, α_1, variable to the coefficient on the *Female-Language* interaction variable, α_f. Building on equation 14, the language penalty of Hispanic women is expressed in the following:

$$\text{Female Language Penalty} = \exp(\alpha_1 + \alpha_f) - 1 \quad (18)$$

For Hispanic men, the language penalty that arises from not speaking English is simply measured by the coefficient that results on the *No English* variable. The computation of the above equations allows me to test whether or not α_f is statistically different from zero, that is if there a statistically significant difference in the language penalty between Hispanic men and women.

A Chow Test[4] is also performed to determine "whether or not two estimated relationships differ significantly (Koutsoyiannis, 1987, p.165)." The purpose of the test is to examine whether the relationship between language skills, other important variables

[4] Koutsoyiannis, A. Theory of Econometrics, 2nd ed., Barnes & Nobel Books, Totowa, New Jersey, 1987.

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and earnings significantly differs between men and women. The null hypothesis is that there is no difference in the coefficients obtained for female and male workers. To perform the Chow Test, three different regression models are run. The first two regressions that are performed for this test are unrestricted models, allowing the coefficients to vary across the genders to test for the null hypothesis. The unrestricted models consist of separate regressions for men and women. The third regression model uses both male and female data, restricting the coefficients to be the same for men and women.

Another factor that may have a significant impact on Hispanic earnings is the neighborhoods in which Hispanics reside. While English skills are needed to work in most communities, the same may not be true if one resides in a predominately Spanish-speaking neighborhood. The need to speak English to communicate with other people is not as significant if one lives in an area where Spanish is the language generally used in personal and professional atmospheres. The issue of concern that arises is, if a person who lives in a community where Spanish is the predominate language, are Spanish-speakers still penalized for poor English skills? A third specification of the model is, therefore, developed that examines how the inability to speak English affects the wages of individuals who live in Spanish-speaking neighborhoods. It is hypothesized that the language penalty is not as severe for Spanish-speakers living in Hispanic neighborhoods, because they would be able to communicate and function in this environment without having to speak English. The language penalty should increase for non-English speakers living and working in areas where English is the primary language spoken. In this

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instance, it would be difficult for workers with limited language skills to communicate with employers, employees and their neighbors.

To capture neighborhood effects I create several variables to measure the effect living in a Spanish-speaking community has on wages. The first variable measures the percentage of Spanish speakers (*Percent Spanish*) who live in each PUMA, as defined by the United States Census. The *Percent Spanish* variable is created by dividing the total number of Spanish-speakers by the total population for a PUMA. This variable enables one to examines how an increase in the Spanish-speaking population affects the wages of all individuals who reside in a Hispanic community, whether they are speak Spanish or not. The interpretation of this variable is presented in the following equation, which begins with the basic model:

$$\ln Y = \alpha_0 + \beta X \tag{19}$$

where X includes the percentage Spanish. The derivative is then taken of both sides of the equation:

$$\beta = \frac{d(\ln Y)}{dX} = \frac{dY/Y}{dx} \tag{20}$$

This equation demonstrates that the coefficient on X says if X is increased by one, Y changes by βx100% and dY/Y is just the percent change in Y.

Next a *Neighborhood-Language* interaction variable is created by multiplying the *Percent Spanish* by the *No English* variable. This *Neighborhood-Language* interaction term is used to estimate the effect having limited English speaking skills has on wages as the *Percent Spanish* per PUMA varies. If the coefficient on the interaction term is negative, the language penalty increases as the percentage of Spanish-speakers increases.

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However, if the coefficient on the interaction variable is positive, the language penalty decreases as the percentage of Spanish-speakers per PUMA increases (Norton, 2001).

As discussed by Sweeny (2003), the inclusion of an interaction variable, in the wage equation, means that estimated coefficients must be interpreted differently than if they had resulted from a basic regression model. The following is a discussion of how interaction variables impact the regression model and how the estimated coefficients should be interpreted. The basic regression model used by most statistical models is expressed in the following equation:

$$Y=\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon \quad (21)$$

where Y is the dependent variable, β_0 is the constant intercept, X is a vector of independent variables affecting Y, β is the corresponding vector of the coefficients, and ε is a random error term whose value is based on an underlying probability distribution. Most studies assume that this basic regression model is always linear and the independent variables include in the model are not related to one another. A linear model assumes that the effect of the independent variable, X_1, on the dependent variable Y is always the same no matter what the values of the other independent variables included in the model may be.

The linear model above may not work for every specification; for example, the effects of the independent variables might vary according to one another. To take into consideration the changing values of the independent variables interaction terms may be introduced. The specification with an interaction variable is the following:

$$Y= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_1 X_2 + \varepsilon_i \quad (22)$$

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The interaction effect is $\beta_3 X_1 X_2$, where X_1 and X_2 where are continuous variables. The addition of this variable allows the relationship between the independent variables and the dependent variable to vary as the value of one or both of the independent variables changes.

The inclusion of the interaction term yields a different interpretation than the basic linear regression model. In the basic regression model, β_1 or β_2 can be interpreted as the marginal effect on Y for a one unit change in X. The same interpretation cannot be made for a model that includes interaction terms, unless of course you eliminate the interaction effect. However, in most cases X is not equal to zero and the resulting estimates of β_1 or β_2 can simply not be interpreted as the marginal effect on the dependent variable.

The correct equations for the conditional interpretation of coefficients in an interaction model, across both covariates are as follows:

$$(\partial Y/\partial X_1 \text{ at } X_2) = \beta_1 + \beta_3 X_2 \tag{23}$$

$$(\partial Y/\partial X_2 \text{ at } X_1) = \beta_2 + \beta_3 X_1 \tag{24}$$

These equations show that that the marginal effect of X_1, on Y, is a function of X_2. Using these equations explains the marginal effect a change in X_1 has on Y, which is the interaction effect.

Special care must also be given to the interpretation of the standard errors. The correct formulas for the calculation of the standard errors are:

$$SE\ (\partial Y/\partial X_1 \text{ at } X_2) = SE\ [\text{var}(\beta_1) + X_2^2\ \text{var}(\beta_3) + 2X_2\ \text{cov}(\beta_1\beta_3)\ ]^{1/2} \tag{25}$$

$$SE\ (\partial Y/\partial X_2 \text{ at } X_1) = SE\ [\text{var}(\beta_2) + X_1^2\ \text{var}(\beta_3) + 2X_2\ \text{cov}(\beta_2\beta_3)\ ]^{1/2} \tag{26}$$

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where var is the variance and cov is the covariance. The resulting standard errors can then be used to test the statistical significance of $\partial Y/\partial X_1$ at different levels of X_2. By including the language interaction variable in the basic wage model, the impact of the neighborhood effect on the language penalty can be determined.

The interaction term, α_s, in this model results from multiplying the *No English* variable by the *Percent Spanish* variable. The specification is captured by the following equation:

$$ln(W) = \delta_0 + \alpha_1 \, No\ English + \alpha_s \, No\ English\ (Percent\ Spanish) \quad (27)$$

The use of the interaction term in this specification allows me to study how the language penalty changes for Hispanics as the percentage of Spanish-speakers per PUMA varies. The following is the interaction model when the *No English* variable is set equal to one:

$$(\ln(W) \mid No\ English = 1) = \delta_0 + \alpha_1 + \alpha_s \, Percent\ Spanish \quad (28)$$

and when the *No English* is set equal to zero:

$$(\ln(W) \mid No\ English = 0) = \delta_0 \quad (29)$$

Equation 29 is subtracted from equation 28, which results in an equation that calculates the language penalty associated with living in a Spanish-speaking neighborhood. The equation for the language penalty, which builds upon the original language penalty equation introduced in equation 14, is as follows:

$$\text{Language Penalty} = \exp(\alpha_1 + \alpha_s * Percent\ Spanish) - 1 \quad (30)$$

The language penalty is, therefore, a function of the percentage of Spanish-speaking per PUMA. Since I am working with an interaction variable, it would be incorrect to interpret either α_1 or α_s as the marginal affect on wages. The correct interpretation of the interaction variable is calculated by adding the percentage change for coefficient on the

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No English variable to the percentage change on coefficient on the *Neighborhood-Language* interaction term times the *Percent Spanish* variable. I use different percentages of Spanish-speakers per PUMA, for example, at the median level and at the 10^{th}, 25^{th}, 75^{th}, and 90^{th} percentile to determine how the language penalty changes as the percentage of Spanish-speakers per PUMA changes.

After the estimation of the language penalty, the standard errors, which measure the dispersion of the estimates around the true parameters, must be calculated so a test can be conducted in order to determine the statistical reliability of the estimated coefficients us to calculate the language penalty. The standard error of the language penalty varies with the percentage of Spanish-speakers, just like the size of the language penalty. Therefore, the standard errors for both men and women need to be calculated at the median level and again at the 10^{th}, 25^{th}, 75^{th}, and 90^{th} percentiles to determine if the coefficients use to estimate of the language penalty are significantly different from zero at different levels of percent Spanish-speaking. The standard error for the estimated coefficients is calculated according to the following equation:

$$\text{SE}(\textit{No English} \text{ at } \textit{Percent Spanish}) = [\text{var}(\alpha_1 \textit{No English}) + \textit{Percent Spanish}^2 * \text{var}(\alpha_3) + 2 * \textit{Percent Spanish} * \text{cov}(\alpha_1, \alpha_3)]^{1/2}. \quad (31)$$

After the standard errors have been calculated for men and women, at every percentile, they are used to calculate the appropriate test statistic that is needed to determine if the estimated coefficients are statistically different from zero. However, before the test statistic is calculated, the hypothesis must be formulated that is used to perform a test for statistical significance. In this case the null hypothesis is $\alpha_1+\alpha_s$ * *Percent Spanish* = 0. The acceptance of the null implies that there is no relationship

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between the independent and dependent variables because the slope of the regression line, in this case, is equal to zero, $Y= \beta_o$. In other words, the interaction variable associated with *No English* and *Neighborhood-Language* does not influence wages and should not be included in the model. The alternative to the null hypothesis must also be defined as $\alpha_1+\alpha_s$ * *Percent Spanish* $\neq$ 0.

Once the null and alternative hypothesis have been established, a level of significance must be chosen so the critical region can be determined. The critical region includes the values of the variables which have a low probability of being observed and corresponds to the level of significance that is chosen. The estimated coefficients are tested at the 1%, 5% and 10% level of significance. These levels allow me to accept rejecting the null hypothesis, when it is actually true (Type I Error), one time in a hundred, five times in a hundred, or ten times in a hundred, respectively.

Once the hypothesis, level of significance and critical regions have been established, the appropriate test statistic can be calculated. Since the variance of the population is unknown for the sample being used in this study a 't' test is used to determine statistical significance of the estimated coefficients. By using the sample information I compute the value of the 't' statistic which is denoted by t*. The transformation formula (t statistic) is expressed in the following equation:

$$t^* = \beta_i / \acute{o}_{\beta i} \quad \text{with } n\text{-}1 \text{ degrees of freedom}$$

where β_i is the least square estimate and $\acute{o}_{\beta i}$ is the standard error. The sample value of t* is estimated by dividing the estimated coefficient by its standard error. The t* is the transformation of the units of the estimated variable into units of the 't' statistic. This transformation enables me to find the probability of the estimated variable assuming any

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value within the critical region (Koutsoyiannis, 1987). If t* falls in the critical region, I reject the null, infer that $\alpha_1+\alpha_s$*$Percent\ Spanish \neq 0$, and accept the alternative hypothesis. The rejection of the null hypothesis means the estimated coefficients are statistically significant and do in fact influence the independent variable wages. However, if t* falls within the accepted region, I accept the null hypothesis and it is concluded that estimated coefficients are not statistically significant. In this model, the acceptance of the null hypothesis would imply that the language penalty, associated with living a Spanish-speaking neighborhood, is not statistically significant and does not influence the wages of Hispanic men and women.

The construction of the above models lead to several predictions in regards to the impact of language skills on wages. Theoretically, the inability to speak English should have a negative impact on the wages of Hispanics. In reviewing the model that includes the *No English* variable, both Hispanic men and women, with limited English skills, should experience a decrease in wages when compared to Hispanics who speak English fluently. These findings would be consistent with past research that indicates that poor language skills are a predictor of lower wages for Hispanics. In regards to the Spanish language neighborhood model, the theoretical model developed shows that the language penalty is a function of the percentage of Spanish-speakers per PUMA. Therefore, based on this model, it is predicted that the type of neighborhood in which Hispanics reside will impact their wages. I expect the interaction variable to receive a negative coefficient.

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CHAPTER 4

DATA COLLECTION

The data are collected from the United States Census Bureau, 2000 Census of Population and Housing, Public Use Microdata Sample (PUMS) for the state of Nevada. The Census offers information representing a five-percent sample of the "occupied and vacant housing units in the United States and the people in the occupied units (U.S. Census, 2000, p.1-1)." The data are broken down into two units, housing records and personal records. The housing records contain information on such items as rent, utilities, taxes, and household income, while the personal records includes information on wages, language ability, age, ancestry, citizenship and educational attainment. The five-percent file contains information on 2.8 million individuals and over 1 million households (U.S. Census, 2000). The five-percent file gives the maximum amount of information that can be reported for an area without breaking confidentiality.

The PUMS data are presented in a very broad manner. Therefore, more specific variables are created to examine the issues that are to be addressed by this study. The most important of these variables is the one that defines "*Hispanic.*" This variable is created from data collected on those individuals who originate from Spain or a Spanish-speaking county. The variable for Hispanic is equal to one for individuals who report being of Hispanic descent, and zero otherwise.

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The natural log of the hourly wage is used in the model as the dependent variable. The *Per Hour Wage* is calculated using the numbers of weeks worked, the hours worked, and the total personal earnings for 1999. Earnings data represent the sum of wage, salary and self-employment earnings received in 1999. Those reporting negative earnings are dropped from the data set. The variable for *Wage* is equal to the total earnings divided by the total hours worked.

No English is the primary variable of interest in this study. It is expected that poor language skills have a negative effect on Hispanic wages. Language ability is gathered from the long-form questionnaire of the Census. Individuals who report they speak a language other than English are asked to rate their ability to speak English according to the following scale: very well, well, not well, or not at all.

There are a total of 4,381 observations in the data set. In Nevada, 3,227 respondents, 73.65%, report they speak English fluently. Those who do not speak English well account for 26.35% of the observations or 1,154 individuals. In regards to educational attainment, 9.13% are college graduates. This includes individuals who have completed any level of education from an associate's degree to a doctorate's degree. 90% of all college graduates speaking English fluently. Approximately 49% of the people in the data set are high school graduates. Of high school graduates, 88.03% report speaking English well and 11.97% report speaking English poorly. Non-high school graduates account for 59.04% of the sample. For those that have not received a diploma, 59.51% do not speak English and 40.49% report they speak English well. Because the sample is restricted to non-college graduates, a dummy variable is created for *High School*

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Graduate, which is set equal to one if the respondent graduated from high school at the time the questionnaire was completed and zero otherwise.

To isolate the impact language skills have of Hispanic earnings and control for other factors, I include several variables that control for demographics, and other, factors. A dummy variable is created for *Female*. Past research indicates that females earn less than their male counterparts. To control for experience, *Age* and Age^2 are included in the study. Although these variables do not capture experience directly, they are a good proxy for a worker's experience. The data sample is restricted to individuals who are between the ages of 18 and 65. Earnings are expected to increase at a decreasing rate over a worker's lifetime; and age is expected to receive a positive coefficient. Age^2 is expected to have a negative influence on earnings.

Veteran status is predicted to have a positive influence on wages. Respondents were asked if they had or are currently serving in the military. The *Veteran* variable is set equal to one when an individual served in the military starting with World War II to present and zero otherwise. In regards to personal characteristics, the variable, *Marriage,* is set equal to one if the respondent reports that he or she was married at the time the Census was completed. As in previous studies, *Marriage* is expected to have a positive influence on wages. The *Non-Citizen* variable is set equal to one if the individual was not born in the United States, U.S. born in Puerto Rico or U.S. island, or born to American parents abroad. This variable should have a negative influence on wages because it is often difficult to gain employment if one is not an American citizen.

The dummy variable, *Full-Time*, was created using information for individuals who worked 40 hours or more a week in 1999 and is expected to have positive

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relationship with wages. The dummy variable, for employment, includes all people who answered yes to the employment question in the questionnaire. Those that are employed are assigned a value of one, while those that are not employed are dropped from the data set completely.

The summary statistics for all the variables used in the model are presented in Table 1. The first column contains the descriptive statistics for the entire sample. The second column reports information on individuals who speak *No English.* The final two columns report the descriptive statistics for male and females, respectively. Eighty-nine percent of the respondents are full-time employees, and 64% are married. Very few Hispanics have veteran status, with only 7% reporting they have been or are currently in the military. About half of the respondents are not American citizens, with 43% reporting they were born abroad. The average age of the sample is 37. Table 1 shows that the mean for the *Percent Spanish* variable is 20.48. This figure tells us, that for the data considered, the average Hispanic worker lives in a community where nearly 21% of all residents speak Spanish.

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TABLE 1

Summary Statistics

Variable	Hispanic Mean	No English Mean	Male Mean	Female Mean
Log Per Hour Wage	2.508 (0.700)	2.360 (0.713)	2.564 (0.679)	2.318 0.737)
No English	0.263 (0.441)	1.000 (0.000)	0.283 (0.451)	0.196 (0.397)
Veteran	0.073 (0.260)	0.022 (0.146)	0.091 (0.287)	0.011 (0.105)
Married	0.641 (0.480)	0.736 (0.441)	0.736 (0.441)	0.315 (0.465)
Age	37.063 (10.539)	36.906 (10.436)	37.029 (10.392)	37.180 (11.031)
Age^2	1484.69 (849.03)	1469.02 (837.73)	1479.08 (841.33)	1503.91 (875.06)
High School Graduate	0.243 (0.429)	0.153 (0.360)	0.237 (0.425)	(0.265 (0.441)
Full-Time Employee	-0.898 (0.302)	-0.896 (0.305)	0.919 (0.273)	0.827 (0.378)
Female	0.226 (0.418)	0.168 (0.374)	0.000 (0.000)	1.000 (0.000)
Non-Citizen	0.438 (0.496)	0.770 (0.421)	0.475 (0.499)	0.310 (0.463)
% Spanish Per Puma	20.48 (11.31)	24.70 (11.27)	20.83 (11.41)	19.31 (10.85)

* Standard deviations in parenthesis

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CHAPTER 5

EMPIRICAL RESULTS

Table 2 presents the results from the basic specification. The first column reports the findings for Hispanic men and women together. The second column reports the findings for Hispanic men and women together and introduces the *Female-Language* interaction variable model. The third and fourth columns display the results for Hispanic men and women. Overall, the findings indicate that poor English skills have a significant impact on the wages of Hispanic men and women. As predicted, the coefficient on the *No English* variable is negative and statistically significant in all of the regressions. The results, in column one, indicate that Hispanic men and women, who do not speak English, have a 15% lower hourly wage compared to Hispanics who speak English.

Of particular interest is the language interaction variable, as reported in column two, and the effect it has on the wages of Hispanic women. The negative and statistically significant coefficient on the *Female-Language* interaction variable indicates that the language penalty is larger for women than men. The language penalty for men is measured by the coefficient that results on the *No English* variable. The results indicate an 11% lower wage for Hispanic men with limited English language ability compared with those that speak English. For women the language penalty is calculated by adding the coefficient on the *No English* variable to the coefficient on the *Female-Language*

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interaction variable, which indicates that non-English speaking Hispanic women receive a wage that is 32% lower than women who speak English. The results show that though there is an overall language penalty for both men and women, Hispanic women appear to experience a greater loss in wages due to poor English language skills.

The results for men only and women only are reported in columns three and four. The coefficients on the *No English* variable are negative and statistically significant at standard levels for both men and women. The specification suggests a reduction in wages of 15% for men who do not speak English. For women, the data indicate a reduction in earnings of 18%. Both Hispanic men and women suffer in the form of lower wages when they have poor English language skills. In both cases there is a significant decrease in earnings. Comparing the four regression models, the findings suggest the language penalty is more severe for women.

The results are as expected for many of the remaining variables. The coefficients on *Age*, Age^2, *Full-Time*, and *Non-Citizen* are all as expected and are statistically significant at standard levels. Each of these variables affects the wages of men and women in the same way. However, the remaining variables have the opposite impact on the wages of men and women. Each has a positive coefficient when included in the model for men only, but result in negative coefficient when used in the model that is restricted to women. For example, the coefficient for *Marriage* is positive for men, but results in a negative coefficient for women. The same is true for the *Veteran* and *High School Graduate* variables. The coefficients for each of these variables are statistically significant at standard levels. It should be noted that the positive impact these variables have on the wages of Hispanic men are consistent with the findings of past studies.

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The findings from the Chow Test suggest that the two estimated functions for men and women significantly differ across the sample. The test resulted in an F ratio of 347.9. The critical value of F at the 95% significance level is 1.88. Since F* is greater than the critical value, I reject the null hypothesis that there is no difference between the two functions. The rejection of the null allows us to accept the alternative hypothesis that the two functions differ significantly and thus change across the data set. As a result of these findings, I limited the analysis to regressions where the model is run separately for men and women from this point forward.

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TABLE 2

Regression Results for No English Model

Variable	Men & Women	Men & Women w/Language Interaction	Men	Women
No English	-0.1657***	-0.1253***	-0.1641***	- 0.1933***
	(6.17)	(4.43)	(5.84)	(2.59)
Veteran	0.0669	0.0663	0.0257	-0.1802
	(1.71)	(1.70)	(0.67)	-(0.45)
Married	0.116	0.1053	0.1044	-0.0838
	(5.13)	(4.66)	(4.00)	-(1.61)
Age	0.0457	0.0469	0.0433	0.0564
	(6.94)	(7.12)	(5.74)	(4.30)
Age^2	-0.0004	-0.0004	-0.0004	-0.0006
	(5.67)	(5.83)	(4.59)	(3.82)
High School Graduate	0.072	0.0668	0.0232	-0.0231
	(2.89)	-2.68	(0.91)	(0.49)
Full-time Employee	-0.1383	-0.1444	-0.233	-0.0649
	(3.07)	(3.20)	(3.85)	(0.97)
Non-Citizen	-0.1088	-0.1097	-0.1359	-0.0928
	(4.52)	-4.56	(5.38)	(1.35)
Female * High School Graduate	-0.2682***	-0.2415***		
	(5.97)	(5.33)		
Female * No English		-0.2036***		
		(3.99)		
R^2	0.0641	0.0678	0.0688	0.046
Observations	4381	4381	3391	990

Absolute Value of t statistics in parenthesis

***Significant at the 0.01 level

** Significant at the 0.05 level

* Significant at the 0.10 level

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The results for the Hispanic neighborhood language specification are presented in Table 3. This model introduces the variable for the *Percent Spanish* per PUMA and the results for men and women separately are presented in columns one and two. The third and fourth columns report the findings for men and women when the *Neighborhood-Language* interaction variable is added to the model.

The results from the *Percent Spanish*[5] model apply to all men and women, regardless of their English language ability. This variable captures the impact that living in a predominately Spanish-speaking community has on the wages of any individual, regardless of their language ability. For Hispanic men the coefficient that results on the *Percent Spanish* variable is 0.0004. The coefficient says that if the percentage of Spanish-speakers is increased by one, wages increase by 0.04%. The wages of Hispanic women are impacted differently by neighborhood effects. The resulting coefficient on the *Percent Spanish* variable for women is -0.0068. A one percent increase in the percentage of Hispanics in a neighborhood reduces Hispanic women's wages by 0.68%.

The results for the *Neighborhood-Language* interaction variable are presented in column three for men and column four for women. The language penalty resulting from having limited English language skills and living in a predominately Spanish-speaking neighborhood follows equation 14 and is estimated by multiplying the coefficient on the *Neighborhood-Language* variable with the *Percent Spanish* per PUMA. This figure is then added to the coefficient that resulted for the *No English* variable. To determine how the language penalty changes as the percentage of Spanish speakers changes, values for different percentiles of Spanish-speakers per PUMA were used to calculate the language

[5] Use of % of Hispanics in the model resulted in finding similar to those found when the % of Spanish-speakers is used in the model.

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penalty. The percentage of Spanish-speaking individuals at the 10% level is 7.50%, 9.76% at the 25% level, 19.24% at median level, and 32.31% at 75% level and finally at the 90% level the percentage of Spanish-speakers is 39.88%.

TABLE 3

Regression Results for Spanish-speaking Neighborhood Model

Variable	Men	Women	Men w/ Neighborhood Interaction	Women w/ Neighborhood Interaction
No English	-0.1659***	-0.1676**	-0.3748***	-0.0903
	(5.47)	(2.39)	(6.06)	(0.87)
Veteran	0.0262	-0.1831	0.0232	-0.1851
	(0.53)	(0.45)	(0.48)	(0.45)
Married	0.1051	-0.086	0.1045	-0.0861
	(3.09)	(1.68)	(3.04)	(1.67)
Age	0.0433	0.0533	0.0094	0.0534
	(4.56)	(4.01)	(4.56)	(4.04)
Age^2	-0.0004	-0.0005	-0.0004	-0.0006
	(3.74)	(3.55)	(3.72)	(3.60)
High School Graduate	0.0235	-0.0196	0.0228	-0.0195
	(1.32)	(0.39)	(1.22)	(0.39)
Full-time Employee	-0.2223	-0.0582	-0.2169	-0.0556
	(2.78)	(0.70)	(2.70)	(0.68)
Non-Citizen	-0.1378	-0.062	-0.1321	-0.0625
	(3.72)	(0.72)	(3.56)	(0.73)
% Spanish Per Puma	0.0004	-0.0068***	-.0.0022	-0.0061***
	(0.29)	(3.81)	(1.52)	(2.67)
% Spanish *No English			0.0089***	-0.0034
			(3.43)	(0.81)
R^2	0.0688	0.0552	0.0732	0.0556
Observations	3391	990	3391	990

***Significant at the 0.01 level
** Significant at the 0.05 level
* Significant at the 0.10 level

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Table 4 reports the findings on the language penalty at different percentiles for Hispanic men and women. For Hispanic men the coefficient on the *No English* variable is negative and statistically significant at the 0.01 level, as expected, at all levels except the 90th percentile. This coefficient implies a language penalty of 18.42% at the median level. The results indicate that the language penalty for Hispanic men decreases as the percentage of Spanish-speakers increases. At the 10% level, men experience a reduction in wages of 26.51%, at the 25% level there is reduction of 25.02%, at the median level there is a reduction of 18.42% and at the 75% level the reduction in wages is 8.36%. Finally at the 90% level, the reduction in wages drops to 1.97% and is no longer statistically significant.

The results are different for Hispanic women. While the underlying coefficients of the language penalty are negative, they do not prove to be statistically significant at standard levels. The findings suggest that for women the language penalty associated with living in a Spanish community increases as the percentage of Spanish-speaking individuals in a community increases. As shown in Table 4, at the 10$^{\%}$ level the findings indicate there is a 10.93% reduction in wages due to the language penalty. At the 25% level the reduction is 11.61%, at the median level the reduction in wages increases to 14.40%, and continues to rise, with an 18.10% reduction at the 75% level and finally a 20.18% decrease in wages at the 90 percentile. The results suggest that while both Hispanic men and women suffer from the language penalty, women are not affected by the percentage of Spanish-speakers that reside in a community.

The results dealing with female neighborhood effects differ when I restrict the sample to include only non-high school graduate. The results are included in the

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appendix. For Hispanic women, the underlying coefficients for the language penalty are negative and statistically significant at the 0.01 level. The findings suggest that women experience a reduction in their wages as the percentage of Spanish-speakers in a neighborhood increases. At the 10% level there is a reduction of 27.28%, at the 25% level it is 28.61%, at the median level the reduction increases to 33.54%, at the 75% level it is 39.78% and finally at the 90% level Hispanic women will see a decrease in their wages of 43.12%. The findings are similar for Hispanic men who did not graduate from high school. The language penalty increases with the percentage of Spanish-speakers. At the 10% level the reduction in wages is 37.41%, at the 25% level it is 37.93%, at the median level they will experience a reduction of 40.09%, while at the 75% level the reduction is 42.49% and finally at the 90% level the reduction increase to 44.53%. For Hispanic men the underlying coefficients of the language penalty also prove to be statistically significant at the 0.01 level. The non-high school graduate model differs from the high school graduate model in that Hispanic women are affected by the percentage of Spanish-speakers in a community. For Hispanic men the reduction in wages increases as the percentage of Spanish-speakers increases, these are the opposite findings from the high-school graduate model where the language penalty for Hispanic men falls as the percentage of Spanish-speakers increases.

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TABLE 4

Language Penalty – Hispanic Men

Percentiles	% Spanish	$\alpha_1 + \alpha_s$ % Spanish	Language Penalty
10%	7.50	-0.3081*** (6.69)	-26.61%
25%	9.76	-0.2880*** (6.87)	-25.02%
50%	19.24	-0.2036*** (6.54)	-18.42%
75%	32.31	-0.0873*** (2.02)	-8.36%
90%	39.88	-0.0199 (0.34)	-1.97%
R^2 Observations	0.0732 3391		

***Significant at the 0.01 level ** Significant at the 0.05 level
* Significant at the 0.10 level

Language Penalty – Hispanic Women

Percentiles	% Spanish	$\alpha_1 + \alpha_s$ % Spanish	Language Penalty
10%	7.50	-0.1157 (1.43)	-10.93%
25%	9.76	-0.1234 (1.24)	-11.61%
50%	19.24	-0.1555 (1.42)	-14.40%
75%	32.31	-0.1997 (1.41)	-18.10%
90%	39.88	-0.2254 (1.36)	-20.18%
R^2 Observations	0.0556 990		

***Significant at the 0.01 level ** Significant at the 0.05 level
* Significant at the 0.10 level

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CHAPTER 6

CONCLUSIONS

This study shows that Hispanics face a language penalty. Both men and women experience a loss in wages due to poor English language skills as is shown in the basic specification of the model. The findings indicate that Hispanics, without English language skills, earn 15% less than Hispanics who speak English fluently. Overall, limited English ability has a significant impact on wages and plays a large role in explaining why Hispanics tend to earn less than other minority groups.

Whereas past research has tended to examine the earnings of Hispanics as a whole, this study shows that there is a difference between Hispanic men and women. The data also shows that the language penalty is greater for Hispanic women than men. Women experience a reduction in wages that is almost three times the amount that men encounter from having limited language skills.

The model developed to examine the impact that percentage of Spanish-speakers per PUMA has on wages demonstrates that women experience a reduction in wages from living in a Spanish-speaking neighborhoods, whereas men experience an increase in wages as the percentage of Spanish-speakers per PUMA increases. The study does not take into consideration the employment and industry structure of Hispanic communities. The available employment in Spanish-speaking neighborhoods may not be as lucrative

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when compared to other areas. The lack of high-paying jobs leads to the lower wages for any individuals who live in an increasingly Spanish-speaking community.

I also find that the effects of living in a Spanish-speaking neighborhood and having limited English skills impact Hispanic men and women differently. For Hispanic men, the language penalty decreases as the percentage of Spanish-speakers in community increases. One explanation for the decreasing reduction in wages may be the illegal job market that exists for Hispanic men. It is possible for a man, who does not speak English, to find a better paying where language is not a major requirement. Men have an advantage over women in that they can rely more on there physical capabilities as opposed to their language ability. Hispanic women earn less than their male counterparts when they have poor English skills and reside in Spanish-speaking communities. The results show that regardless of what type of neighborhood women reside in they earn lower wages. There may be characteristics, other than language skills, that better explain the lower earnings of Hispanic women, such a family responsibilities or lower returns to education. This study shows that further investigation into the specific earnings of Hispanic women and why they tend to earn less than men and other minority women is needed.

Although the results provide compelling evidence that English language proficiency impacts the earnings of Hispanic men and women, there are some limitations to the study. First, the study includes only Hispanics who live in the state of Nevada. It would be useful to expand the data set to include Hispanics who live in other states. It might also be beneficial to compare Hispanics who reside in western states with those who live in the east. Secondly, the model developed does not take into consideration the

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occupations of the individuals who are included in the study. Nor does it consider the industries that are located in Hispanic neighborhoods. However, language skills may not be the only reason that wages are reduced in these communities. Employers may not be wiling to locate their companies in Hispanic neighborhoods, due to social issues, and therefore individuals who reside in these communities will face lower wages or be forced to travel away from their homes to increase their earnings. The availability of good paying jobs may actually play a greater role in determining wages for Hispanics than the language penalty associated with having limited English language proficiency and living in a Spanish-speaking community.

The techniques used here may be applied to further research. The model developed in this study can be used to examine the relationship between English language proficiency, segregation of Hispanics and wages. Language skills seem to play a major role in lives of Hispanics. The results from this study can be used to determine how English proficiency impact Hispanics in other areas of their professional lives. For example, if Hispanics with limited English skills are prohibited from working in certain industries or if they face greater discrimination due to the fact that they are not able to speak English well. This study expands past research by incorporating a Spanish-speaking neighborhood into the model. However, the model can be further built upon by examining how Hispanics, with limited English language skills, fare in other types of communities and job environments, such as a community that includes other types of minorities or is all white.

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APPENDIX

Spanish-speaking, Non-High School Graduate
Neighborhood Model

Variable	Men	Women	Men w/ Neighborhood Interaction	Women w/ Neighborhood Interaction
No English	-0.1551***	-0.2141***	-0.4405***	-0.2634***
	(3.47)	(3.38)	(5.93)	(2.21)
Veteran	0.0546	-0.305	0.0498	-0.3019
	(1.05)	(0.54)	(0.95)	(0.53)
Married	0.1175	-0.0655	0.119	-0.0659
	(3.10)	(1.12)	(3.19)	(1.12)
Age	0.0452	0.0541	0.0441	0.0541
	(4.20)	(3.49)	(4.07)	(3.48)
Age2	-0.0004	-0.0005	-0.0004	-0.0005
	(3.47)	(2.94)	(3.35)	(2.94)
Full-time	-0.2825	-0.0589	-0.245	-0.0607
Employee	(3.79)	(0.71)	(3.67)	(0.73)
Non-Citizen	-0.1566	-0.0561	-0.1474	-0.0551
	(4.36)	(0.59)	(4.07)	(0.58)
% Spanish	0.0002	-0.007***	-0.0037**	-0.0075***
Per Puma	(0.17)	(3.86)	(2.54)	(3.38)
% Spanish			0.0122	0.0022
*No English			(0.84)	(0.41)
R^2	0.0746	0.0590	0.0830	0.0592
Observations	2588	728	2588	728

Absolute Value of t statistics in parenthesis
***Significant at the 0.01 level
** Significant at the 0.05 level
* Significant at the 0.10 level

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Language Penalty – Hispanic Men
Non-High School Graduate Model

Percentiles	% Spanish	$\alpha_1 + \alpha_s$ % Spanish	Language Penalty
10%	7.50	-0.4685*** (8.52)	-37.41%
25%	9.76	-0.4769*** (9.55)	-37.93%
50%	19.24	-0.5123*** (13.72)	-40.09%
75%	32.31	-0.5611*** (10.53)	-42.49%
90%	39.88	-0.5894*** (8.14)	-44.53%
R^2	0.0830		
Observations	2588		

***Significant at the 0.01 level ** Significant at the 0.05 level
* Significant at the 0.10 level

Language Penalty – Hispanic Women
Non-High School Graduate Model

Percentiles	% Spanish	$\alpha_1 + \alpha_s$ % Spanish	Language Penalty
10%	7.50	-0.3199*** (3.52)	-27.38%
25%	9.76	-0.3370*** (4.01)	-28.61%
50%	19.24	-0.4085*** (5.68)	-33.54%
75%	32.31	-0.5071*** (4.90)	-39.78%
90%	39.88	-0.5642*** (4.18)	-43.12%
R^2	0.0592		
Observations	728		

***Significant at the 0.01 level ** Significant at the 0.05 level
* Significant at the 0.10 level

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