Using Achievement Tests to Measure Language Assimilation and Language Bias among the Children of Immigrants

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Abstract

We exploit the test language randomization (Spanish or English) in Woodcock Johnson achievement tests administered to children of adults interviewed in the New Immigrant Survey to estimate the causal impact of language on test scores. Randomization allows measurement of the degree and speed of language assimilation and the costs of taking tests in one's non-dominant language. Foreign born children receive higher scores when tests are in Spanish; U.S. born children show higher scores in English. However, foreign born children arriving at an early age or having spent several years in the U.S. do not benefit from taking tests in Spanish.

Keywords: Immigration, Language assimilation, New Immigrant Survey, Woodcock Johnson achievement tests

JEL classification: J24, I20, J18, O15, F22

1. Introduction

Concern over immigration and immigrant assimilation in the late twentieth century has not abated as we have moved into the twenty-first. Fueled by worry over shifts in the composition of the immigrant pool, policy makers and the public debate the assimilation prospects for these recent migrants. Of the 9,095,417 people granted legal permanent residency between 1991 and 2000, 30.7 percent were from Asia, 24.7 percent from Mexico, and only 14.9 percent from Europe. By contrast, of the 3,321,677 persons granted legal permanent residency between 1961 and 1970, 33.8 percent were from Europe, 12.9 percent from Asia, and 13.7 percent from Mexico (U.S. Department of Homeland Security, 2003). This shift in sending regions, and the lower average education levels associated with these countries, has increased anxiety over whether new arrivals will integrate economically and socially in a similar manner to previous waves (Massey, 1981, 1995; Card, DiNardo and Estes, 2000; Card, 2005).

The potentially declining quality of immigrants raises concern as it is directly linked to their future earnings potential and their possible need for means-tested public assistance (Blau, 1984; Borjas, 1985; Borjas and Trejo, 1991; Trejo, 1992; Borjas and Hilton, 1996). The increased presence and visibility of ethnic enclaves and their replenishment with new arrivals also raises questions about immigrants' prospects for integration (Zhou and Logan, 1989; McManus, 1990; Chiswick and Miller, 2005). Although these concerns and data limitations have primarily led to a focus on adult outcomes (Espinoza and Massey, 1997; Dávila and Mora, 2000, 2004; Akresh, 2006), Card argues that "second generation immigrants are a growing fraction of the population, accounting for 10 percent of teenagers nationwide. Nearly all of them will spend their entire lives in the U.S., and will pay taxes and receive income support payments. Thus, the success of immigrants' children is an important component of the long-run costs and benefits of

immigration. For these and other reasons the relative success of the second generation provides a key gauge of the extent to which their parents assimilated into the U.S." (Card, 2005: p. F317). To the extent that immigrant children's English proficiency has been examined, studies have been limited to one geographic area or are qualitative, restricting their generalizability (Portes and Schauffler, 1994; Rumbaut and Portes, 2001; Golash-Boza, 2005). These points, combined with research by Bleakley and Chin (2004) demonstrating the causal role of English proficiency on adult earnings and other research indicating the importance of English for economic mobility and labor market success (McManus, Gould and Welch, 1983; Kossoudji, 1988; Tainer, 1988), underscore the importance of understanding how children develop English proficiency.

In the current paper, we use child achievement test data from the New Immigrant Survey to examine language assimilation, considered in this context to be the development of English proficiency and the transition to English dominance, among the children of Hispanic immigrants. The New Immigrant Survey sampled adult immigrants granted legal permanent residency during May to November 2003 and administered four Woodcock Johnson achievement tests to the co-resident children of this sample. The achievement tests were randomly administered in either English or Spanish to children of Hispanic immigrants. Our empirical identification strategy exploits this test language randomization to measure the degree and speed of language assimilation, as well as the potential costs associated with taking a test in one's non-dominant language. These costs are measured as the test score bias due to the language of test administration; we demonstrate that taking an achievement test in one's non-dominant language can result in lower test scores that are uniquely attributable to this factor. If poor scores on the achievement tests are due to limited English proficiency, these students may fare similarly poorly in other academic outcomes and be tracked into non-honors classes, less academically oriented

schools, and less competitive post-secondary schools (Valdés and Figueroa, 1994). This tracking due to limited English proficiency (rather than a lack of motivation or intelligence) may have long-term implications. This relationship is particularly important as Latinos are less likely to enroll in postsecondary education and are twice as likely to drop out of high school as non-Hispanic whites (Pew Hispanic Center, 2002; Fry, 2003). Research with alternative data suggests a strong link between achievement test scores and later life outcomes (Murnane, Willet and Levy, 1995; Neal and Johnson, 1996). In particular, Currie and Thomas (2001) use the National Child Development Study in Britain and find achievement test scores at age seven are predictive of future labor market outcomes as well as future earnings for men and women. Duncan et al. (2007) conduct a meta-analysis using six datasets and show that early assessments of math and reading skills are the strongest predictors of later academic and occupational achievement.

The test language randomization reveals that average scores for tests taken in English were significantly higher for two of the four tests but significantly lower for one test with no difference on the fourth test. However, this result masks significant heterogeneity of the impact of test language that has important implications for understanding immigrant assimilation and for developing accurate policy prescriptions.

When examining this heterogeneity, we find children of Hispanic immigrants exhibit stronger English language skills than predicted by models of immigrant language assimilation. These models argue that first generation (foreign born) immigrants are monolingual in their native language, second generation (U.S. born children of foreign born parents) immigrants are bilingual in English and their native language, and third generation (U.S. born children of U.S. born parents and foreign born grandparents) immigrants are monolingual in English (Fishman (1972) for seminal work and Stevens (1992) and Alba et al. (2002) for empirical tests of the

model). Further, Lazear (1999) shows that incentives to learn a majority language depend on immigrant's ethnic and linguistic surroundings. As foreign born Hispanics tend to live in ethnically concentrated areas (Iceland and Scopilliti, 2008), their incentives to learn English may be weak. While this may be true for their parents, we find second generation children of Hispanic immigrants are English dominant, with results showing a one standard deviation disadvantage for U.S. born immigrant children given tests in Spanish instead of English. This result could be due to different incentives faced by children of immigrants, many of whom are immersed in English at school, are likely more receptive to U.S. mass media, show general preferences for English, and tend to associate English proficiency with status (Portes and Schauffler, 1994).

The unique ability of the current study to look at tests randomly administered in both English and Spanish provides the opportunity to examine the speed of the transition to English dominance; we find that this occurs at a rapid pace for foreign born children. Children arriving in the U.S. at an early age or having spent more than three years in the U.S. do not benefit from taking the achievement tests in Spanish. This raises doubts about the conclusions of Alba et al. (2002) who find that descendants of Spanish speakers learn English slower than previous immigrants and slower than current immigrants from other regions. While our findings are consistent with other studies indicating English proficiency and scores on tests administered in English increase with time in the U.S. and with generational status (Portes and Schauffler, 1994; Glick and White, 2003; Akresh, 2006; Cortes, 2006), we are able to use a more objective and continuous measure of language ability instead of commonly used self-reports and we are able to compare test scores in English and Spanish.

Lastly, we find an effect of being born in the U.S. that impacts test scores beyond English proficiency. Among children with limited English proficiency, foreign born children only excel

if the test is in Spanish, while no significant difference in test scores based on the test language is observed for U.S. born children. This language advantage for limited English proficient U.S. born children could be due to test-taking skills learned in U.S. schools or general immersion in American culture, but within a short time period, Hispanic immigrant children learn English.

The remainder of the paper is organized as follows. Section 2 describes the New Immigrant Survey data and Woodcock Johnson achievement tests. Section 3 describes the empirical identification strategy and presents results and robustness tests. Section 4 concludes.

2. Data and Empirical Setting

2.1 New Immigrant Survey Data

The data used in this study come from the New Immigrant Survey (NIS) 2003 cohort. The survey was originally pilot tested with a 1996 sample cohort of immigrants (refer to http://nis.princeton.edu for additional information). The sampling frame for the 2003 data was immigrants aged 18 and older who were granted legal permanent residency between May and November 2003 and the response rate was 69 percent (Jasso et al., *Forthcoming*).[1] Interviews were conducted in the language of the respondent's choice as soon as possible after legal permanent residency was granted and individuals who were new arrivals to the U.S. as well as those who had adjusted their visa status were included in the sample (Jasso et al., *Forthcoming*).[2]

Woodcock Johnson III tests were administered to all co-resident biological, step, and adopted children of the sampled adult immigrants.[3] In order to assess any test score bias due to

[1] The sampling design dictates that undocumented migrants and others without legal permanent residency status are not eligible for inclusion.

[2] There is substantial variation in the duration of U.S. experience among the sampled adults and their children since 66 percent of the sampled adult Hispanics adjusted their status to legal permanent residence while already in the U.S. and 34 percent were granted legal permanent residency as new arrivals.

[3] The co-resident sample used here is distinct from the NIS sample of adopted children and children of U.S. citizens. Biological children represent 97.3 percent of the co-resident sample (899 children) and all results are consistent if the analysis is restricted to these children. There are 6 stepsons (0.7 percent of the sample), 18 stepdaughters (1.9 percent of the sample), and 1 adopted child (0.1 percent of the sample) who make up the remainder of the sample.

limited English proficiency, children whose sampled immigrant parent was born in a Spanish-speaking country and whose first language was Spanish were randomly administered the test in English or Spanish. Of the 1,029 experiment eligible children who completed the tests, 924 are available for the majority of the analysis. One hundred and five observations cannot be used due to missing information on the country of birth, a key variable in the analysis.[4] Of the 924 children, 472 completed the tests in English and 452 completed the tests in Spanish. Forty-seven percent of the parents of the 924 children are from Mexico, 24 percent from El Salvador, 9 percent from Guatemala, and no other origin country accounts for more than 5 percent.

2.2 Woodcock Johnson III Tests

Four achievement tests were administered to age eligible children. The Passage Comprehension and Calculation tests were administered to children age six to twelve inclusive (leaving 689 children available for these analyses). The Applied Problems and Letter Word Identification tests were administered to children age three to twelve inclusive (using all 924 children). The Passage Comprehension and Calculation tests are designed to evaluate reading comprehension and vocabulary and mathematical and quantitative ability, respectively. The Applied Problems test measures aptitude in practical problem solving in mathematics, while the Letter Word Identification test evaluates symbolic learning and reading identification skills (Woodcock and Johnson, 1989). As described by Johnson and Schoeni (2007), the Woodcock Johnson test is an easel test, where the answer book is placed in front of the respondent. The interviewer is instructed to place the easel at an angle that allows them and the respondent to view the pictures simultaneously. The order of question presentation is crucial as the easiest questions are presented first followed by increasingly harder ones. The starting point for the test is determined

[4] A t-test comparing the 924 children in the analysis and the 105 excluded children who are missing country of birth information reveals no statistically significant difference between the proportions administered the test in Spanish.

by the education level of the child.[5] The Woodcock Johnson Foundation normed the test scores by age based on U.S. national averages to have a mean of 100 and a standard deviation of 15.

The Batería is the Spanish language version of the Woodcock Johnson III (WJ III) tests. Tests for the Batería were either translated directly from English or were adapted from the WJ III English test. For the four tests administered in the NIS, Calculation was a direct translation while Applied Problems, Passage Comprehension, and Letter Word Identification were adapted for use with Spanish-speaking individuals. Adaptation was used when the key measurement concept was the same, but the items in the question were changed in some way. All Batería test translations and adaptations were carried out by or under the supervision of a team of professional certified Spanish translators (Schrank et al., 2005). Every effort was made to administer the tests to all children in the same manner with respect to language intensity. Both the reliability and the validity of the Batería tests are comparable to the WJ III (Schrank et al., 2005).

The sample used to calibrate and norm the Spanish-language items came from both within and outside the U.S. Data were obtained from 1,413 native Spanish-speaking individuals from a range of Spanish-speaking countries. In comparison, for the WJ III, normative data were drawn from a national U.S.-based sample of 8,782 individuals based on the 2005 U.S. Census; this provides the most current comparison to the U.S. population (McGrew, Schrank and Woodcock, 2007). Batería calibration data have been equated to the WJ III norms, making the scores on the English and Spanish tests directly comparable (Schrank, McGrew and Woodcock, 2001; Schrank et al., 2005).

[5] For the administration of these tests to children in the New Immigrant Survey, the NIS administrators took into account the immigrant children's unique backgrounds. Because these children may not have received as much education as similar-aged non-immigrant children, the starting level for their achievement tests was adjusted accordingly. Specifically, children in preschool through third grade began each test at the suggested level for one grade below their actual school grade. As the relationship between school grade and level of achievement test difficulty is not perfectly linear, children in grades four and higher began the test at the suggested level for two grades below their actual school grade.

3. Identification Strategy and Empirical Results

3.1 Descriptive Statistics

As stated earlier, the four Woodcock Johnson achievement tests were randomly administered in English or Spanish to children of Hispanic immigrants. To confirm that the randomization was effective, in Table 1, we compare characteristics for children randomly administered the test in English with characteristics for those children randomly administered the test in Spanish. The final column presents the mean difference across test language as well as the standard error of the difference. For almost all characteristics, there is no statistically significant difference for those children who take the test in English or Spanish. The fraction of children who are born in the U.S., the child's age at arrival, the number of years spent in the U.S., and the proportion of the child's life in the U.S. are similar across the randomized test languages. Similarly, the child's years of education, years of education in the U.S., age, and whether English is spoken at home do not significantly differ across the groups of children who were randomly given the test in English or Spanish. A higher proportion of Spanish language test takers are female, a difference that is statistically significant at the 10 percent level. To address this potential bias, in the regression analysis, we include controls for the child's gender and the results do not change. Finally, there are no statistically significant differences across parent characteristics, including parent's years of education, parent's English proficiency, or the parent's number of years of U.S. experience.

To examine the relationship between language and test scores, we compare mean test scores for children who took the test in the different languages. Table 2 presents the results for each of the four achievement tests. Of the 689 children who took the Passage Comprehension and Calculation tests, 348 took the test in English and 341 in Spanish. Mean scores for these tests (in Panel A) are higher for those children who took the test in English and the differences are

statistically significant at the 1 percent level. For the Applied Problems and Letter Word Identification exams, 472 children took the tests in English and 452 took the tests in Spanish. Panel B of Table 2 indicates that for the Applied Problems test there is no significant difference in average test scores based on test language. Finally, for the Letter Word Identification exam, children taking the test in Spanish performed on average 4.75 points better than children taking the test in English, and the difference is statistically significant at the 1 percent level.

To better understand these patterns, we examine the test score differentials by nativity status, which leads to the identification of two distinct treatment effects: (a) the effect of taking the tests in English (versus Spanish) for U.S. born children and (b) the effect of taking the tests in English (versus Spanish) for foreign born children. This focus on a heterogeneous impact of test language guides the remainder of our analysis.

In Table 3 Panel A, we present average achievement test scores for three distinct groups of first generation immigrant children. Columns 1 and 2 are for experiment eligible children of Hispanic immigrants who are randomly assigned to take the test in English (column 1) or Spanish (column 2). Column 3 presents test scores for non-experiment eligible children, all of whom take the test in English and are children of non-Hispanic immigrant parents. The test language randomization indicates large differences between foreign born children of Hispanic immigrants who took the tests in English compared to Spanish. For three of the four tests, foreign born children taking the test in Spanish score 10.71 to 22.54 points (0.71 to 1.50 standard deviations) higher than those who take the test in English and the differences are significant at the 1 percent level. Only the Calculation test shows no significant difference in mean test scores by language. Comparing the children of Hispanic immigrants with the children of non-Hispanic immigrants provides a useful benchmark to measure the magnitude of the impact of test language

on test scores. This comparison shows that English proficiency is significantly worse for Hispanic foreign born children compared to the non-experiment eligible foreign born children of other immigrant origin groups. The Hispanic children who take the tests in English have lower average test scores with deficits ranging from 6.11 to 14.44 points. This result contrasts with that for the foreign born children of Hispanic immigrants who take the tests in Spanish. When comparing these children with the non-Hispanic children, for the Passage Comprehension and Applied Problems tests there are no statistically significant differences and for the Letter Word Identification test the Hispanic children taking the test in Spanish score significantly better. Only for the Calculation test do Hispanic children taking the test in Spanish still do significantly worse than the non-experimental children.

Panel B of Table 3 is analogous to Panel A but is restricted to second generation children. The test randomization results for U.S. born children are in stark contrast to those in Panel A in which foreign born children taking the test in Spanish did significantly better than those taking it in English. U.S. born children of Hispanic immigrants who take the achievement tests in English experience significantly higher test scores than those who take the tests in Spanish. Results are significant at the 1 percent level for the Passage Comprehension and Calculation exams, at the 5 percent level for the Applied Problems test, and are not statistically significant for the Letter Word Identification test. This reversal is a combination of U.S. born Hispanic children scoring both higher on the tests in English and lower on the tests in Spanish compared to foreign born Hispanic children. When comparing the U.S. born children of Hispanic immigrants with those of non-Hispanic immigrants, significant differences in English proficiency persist, but the size of the gap is greatly reduced compared to foreign born children. The U.S. born non-experiment eligible, non-Hispanic children have higher average test scores for all four tests than the children

of Hispanic immigrants who take the test in English. The differences are significant at the 1 percent level for three of the four tests, but the magnitudes are smaller than those reported in Panel A for the foreign born children. Finally, results indicate that Spanish ability has also decreased for U.S. born children of Hispanic immigrants. U.S. born non-Hispanic children score significantly better on all four tests than U.S. born children of Hispanic immigrants who were randomly administered the test in Spanish and the results are significant at the 1 percent level. These differences are even larger than those in Panel A where Hispanic foreign born children taking the test in Spanish appeared to narrow the gap in test scores with non-Hispanic children.

3.2 Empirical Regression Results

While the previous differences in means are informative, they do not control for other factors that might influence test scores. In Table 4, we estimate OLS regressions with an interaction between birthplace and test language to model for the heterogeneity in test language impact seen in Table 3. We then re-estimate these regressions including child and parent characteristics.[6] We see clear evidence that the test language impact depends on nativity. In Table 4's Panel A (column 1), U.S. born children of Hispanic immigrants who take the Passage Comprehension test in English experience almost a full standard deviation advantage (13.20 points higher) compared to foreign born children who take the test in English, while the foreign born who take the test in Spanish experience a 10.71 point advantage compared to foreign born children taking the test in English. Meanwhile, children of Hispanic immigrants who are born in the U.S. but take the test in Spanish experience a disadvantage of 1.46 standard deviations (21.86 points), suggesting English dominance within this group. This pattern holds when including controls for only child characteristics (column 2), only parent characteristics (column 3), and both child and parent

[6] Correlation among the error terms for children in a given household might bias the OLS standard errors downward, so in all regressions we cluster the standard errors by household (Moulton, 1986).

characteristics (column 4).[7] The child and parent characteristics (coefficients not shown) generally exhibit the expected signs and are jointly significantly different from zero at the 1 percent level. The most consistent and statistically significant characteristic is the parent's years of education which is positively correlated with higher average test scores for all four achievement tests. Consistent with the results in Table 3, the Calculation test results in Panel B do not reveal a significant effect of test language or birthplace. There is no statistically significant difference by test language for foreign born children, and there is no statistically significant difference between foreign and U.S. born children who take the test in English.

Panel C and D in Table 4 presents regressions for the Applied Problems and Letter Word Identification tests, and results are similar to the Passage Comprehension test. Foreign born children who are randomly given these tests in Spanish instead of English experience a benefit of 13.66 and 22.54 points, respectively, compared to the 10.71 point advantage in the Passage Comprehension test. Taking the tests in English for U.S. born compared to foreign born children yields a 14.07 and 6.99 test score advantage, respectively. Overall, these patterns are robust to the inclusion of parent and child characteristics and indicate a substantial advantage for second generation children of Hispanic immigrants who take the test in English and for first generation children of Hispanic immigrants who take the test in Spanish, and a substantial disadvantage for U.S. born children of Hispanic immigrants who are randomly administered the test in Spanish.

3.3 Alternative Specifications and Robustness Checks

To examine how test language impacts children at different levels of the test score distribution, in Table 5, we estimate quantile regressions for the 10^{th}, 25^{th}, 50^{th}, 75^{th}, and 90^{th} percentiles.

[7] The child characteristics include birth year dummies, child's years of education, child's years of U.S. education, child's sex, and whether English is spoken at home (based on the parent's report). The parent characteristics include parent's years of education, parent's English proficiency, parent's years of U.S. experience, and parent's years of U.S. experience squared.

Results indicate that, in general, at the lowest quantiles of the distribution, the impact of test language and birthplace are significantly larger. For instance, U.S. born children in the 10th percentile on the Passage Comprehension test experience a 66.93 point disadvantage if given the test in Spanish; similar children experience a 49.47 and 20.52 point disadvantage on the Applied Problems and Letter Word Identification tests, respectively. For each achievement test, we compare the coefficients on the U.S. born, test in Spanish, and U.S born interacted with test in Spanish variables at the 10th and 90th percentiles and at the 25th and 75th percentiles and can reject at the 1 percent level that they are jointly equal in magnitude. The quantile regression results indicate that the mean impact in the baseline regressions is in part driven by the tails of the distribution (e.g., U.S. born children who speak only English and are randomly given the test in Spanish and do substantially worse).

The baseline results could be driven by observable household characteristics (e.g., wealth or occupation) or unobservable characteristics (e.g., preferences to learn English, parents' aspirations for their children) that we are not able to control for, so to test the robustness of the previous results, in Table 6 we estimate a sibling fixed effects specification. The sibling fixed effects estimation controls for factors that are constant across siblings in a given household. Identification is driven by multiple child households with children who differ in their birthplace (U.S. or foreign born) and by households with children who differ in the language of test administration (Spanish or English).[8] We find that even after controlling for both unobserved and observed household characteristics that are constant across siblings, the original results in Table 4 are robust. U.S. born children taking the test in English score 13.38, 21.92, and 19.73 points higher than foreign born children given the test in English for the Passage Comprehension,

[8] For the age restricted sample of 689 children (columns 1 and 2 in Table 6), 435 of them are in multiple child families and 254 are in single child families. Of the 924 children in the remaining analysis (columns 3 and 4), 584 of them are in multiple child families and 340 are in single child families.

Applied Problems, and Letter Word Identification tests. On the same three tests, foreign born children taking the test in Spanish instead of English also experience a significant advantage of 12.89, 17.77, and 28.23 points respectively. For these three tests, U.S. born children randomly administered the test in Spanish experience 18.40, 22.75, and 29.23 points lower scores on the three tests respectively (corresponding to drops of 1.23, 1.52, and 1.95 standard deviations). As with the previous analysis, the results for the Calculation test do not show a strong impact of test language and birthplace on test scores. U.S. born children taking the Calculation test in English do not score higher than foreign born children taking it in English and there is no additional disadvantage for U.S. born children who take the test in Spanish, indicating that the skills required to succeed on the quantitative test are uncorrelated with test language or birthplace.

Having provided evidence that children of Hispanic immigrants experience a significant degree of English language assimilation and having tested the robustness of these results, we next attempt to measure the speed of this language assimilation. In Table 7, we present baseline regressions similar to those in Tables 4, but we incorporate the child's age at arrival in the U.S. (Panel A), child's years in the U.S. (Panel B), and percent of the child's life spent in the U.S. (Panel C). We find that first generation children who arrive in the U.S. at an early age or children who have spent more than three years or about one-third of their life in the U.S. do not benefit from taking the achievement tests in Spanish. Results in Panel A indicate that, for children who take the test in English, for each additional year older that the child came to the U.S., test scores on the Passage Comprehension, Applied Problems, and Letter Word Identification are reduced by 2.20, 2.57, and 1.55 points respectively. Similarly, for children who take the test in Spanish, each additional year older that they arrive in the U.S. is associated with a 2.99 to 4.41 point test score gain. Panel B yields qualitatively similar conclusions indicating that, for children given the

test in English, each additional year the child is in the U.S. is associated with a 1.92, 1.50, and 1.46 point higher score on the Passage Comprehension, Applied Problems, and Letter Word Identification tests, respectively. For each additional year the child is in the U.S., test scores for children randomly administered the test in Spanish decline by 2.67, 2.86, and 3.02 points respectively for these same three tests. Panel C indicates that each additional one percent of the child's life spent in the U.S. is associated with a 0.23 point increase in the Passage Comprehension score for those who are randomly administered the test in English and a decrease of 0.33 points for those given it in Spanish. Put differently, for children given the test in English, a one standard deviation (34.6 percent) increase in the percent of the child's life spent in the U.S. would be associated with an increase of 7.89 points in the Passage Comprehension test score, 8.20 points for the Applied Problems, and 5.05 points for Letter Word Identification. Conversely, a one standard deviation increase in the proportion of life spent in the U.S. is associated with an 11.45 point deficit for Spanish language test takers in Passage Comprehension, 10.62 points for Applied Problems, and a 12.77 point disadvantage for the Letter Word Identification test.[9]

To further examine how quickly children of Hispanic immigrants acquire English language skills, we explore the non-parametric relationship between achievement test scores, test language, and characteristics measuring the child's length of U.S. exposure. In Figures 1 and 2, we estimate kernel weighted local polynomial regressions of test scores, broken down by randomized test language, on the child's age at arrival in the U.S. and years in the U.S.,

[9] Households with children who arrive at an early age (or who have been in the U.S. for more years) might be systematically different from households with children who arrive at an older age (or who have been in the U.S. for fewer years). To examine if these factors influence the observed test language and test score relationship, we include sibling fixed effects in the Table 7 specifications. Results (not reported) are robust to controlling for household observed and unobserved characteristics that are constant across siblings, indicating that within a given household, the sibling who spent more time in the U.S. or arrived at an earlier age scores better than the other siblings on the achievement tests when given in English.

respectively.[10] Figures 1a to 1d indicate a non-linear relationship between age at arrival and average test scores in English and Spanish. Children who arrive in the U.S. at younger ages experience a test score advantage when given the test in English, while those who arrive at older ages generally experience a strong disadvantage if randomly given the test in English. Figure 1a indicates a crossover in scores by test language at approximately age seven such that children who come to the U.S. prior to this age experience an advantage when taking the Passage Comprehension test in English, while those arriving at older ages experience an advantage when the test is given in Spanish. Figure 1b suggests a similar crossover point for the Calculation test, although there is no subsequent drop in test scores for children who arrive at older ages and take the test in English. The Applied Problems (Figure 1c) and Letter Word Identification tests (Figure 1d) indicate that the distinction between taking the test in English and Spanish is less pronounced for children who arrive up to age four, at which point there is a clear Spanish language advantage. Children arriving after age four have a substantial advantage to take both tests in Spanish or, conversely, a disadvantage for being randomly given the test in English.

Figures 2a to 2d display the non-parametric relationship between test scores and a child's years spent in the U.S., broken down by the randomized test language, and show comparable patterns to those in Figure 1. Figure 2a displays a test score advantage for children who have been in the U.S. less than 3 years and were randomly administered the test in Spanish, while children of Hispanic immigrants who have been in the U.S. more than 3 years experience a substantial deficit if given the test in Spanish. The Applied Problems and Letter Word Identification tests display similar patterns, with children who have spent fewer years in the U.S. doing significantly better on the achievement tests if the randomized test language is Spanish and

[10] Non-parametric regression results of the relationship between test scores and the fraction of the child's life spent in the U.S. are consistent with the results in Panel C of Table 7. Taking the tests in Spanish provides an advantage for children who have only spent a small fraction of their lives in the U.S.

experiencing no advantage or even a small deficit if they have spent many years in the U.S. and the test language is Spanish. Consistent with the previous tables, the results for the Calculation test show no clear correlation between test scores and test language.

The results from the previous tables indicate that the impact of the randomly assigned test language is critically linked with a child's birthplace and whether the child is a first or second generation immigrant. In an attempt to disentangle the mechanisms explaining why birthplace matters for achievement test scores, in Table 8 we use a sub-sample of 514 children for whom explicit information was collected on the child's English proficiency.[11] This allows us to determine if birthplace is simply proxying for proficiency in English. We compare average test scores for each achievement test for English proficient and limited English proficient children who were randomly administered the tests in Spanish or English and results are broken down by birthplace. For English proficient children (both foreign born and U.S. born) being randomly administered the Passage Comprehension, Applied Problems, or Letter Word Identification tests in English instead of Spanish generally yields a higher average test score.[12] This differs from the results for the limited English proficient children. For foreign born, limited English proficient children, results indicate 23.56 to 42.19 points (1.57 to 2.81 standard deviations) lower average test scores for those taking the test in English instead of Spanish. This contrasts with U.S. born limited English proficient children whose test scores show no statistically significant difference if they are administered the test in English instead of Spanish.[13] These results indicate an effect of being born in the U.S. that impacts achievement test scores beyond English proficiency. In

[11] Only 514 children out of the 924 are available for these analyses as information on the child's English proficiency was only gathered for those children who were administered the complete child interview.
[12] The difference in average test scores for English proficient children taking the test in Spanish or English can be calculated by adding the regression coefficients from Table 8 for the test in Spanish main effect and the interaction term of English proficient times test in Spanish.
[13] The notable exception to these English proficiency results again is in the Calculation test, where language is arguably less of a determining factor in quantitative reasoning.

summary, for both U.S. and foreign born children proficient in English, there is generally an advantage to being given the test in English. However, for limited English proficient children, foreign born children experience a significant disadvantage when taking the test in English, but U.S. born children experience no significant difference if randomly given the test in English. This is evidence that, although these U.S. born children may not yet have attained English fluency, their time in the U.S. and immersion in American society are imparting skills that translate into improved achievement test scores.

4. Conclusions

This is the first paper we are aware of that can explicitly measure the extent and rate of language assimilation among the children of Hispanic immigrants. Our identification strategy exploits the test language randomization of the four Woodcock Johnson III tests in the New Immigrant Survey and allows us to address potential selection biases that have hindered previous comparisons of educational achievement. Although an initial comparison of the test scores by randomized test language indicates that English language test takers score higher than Spanish language test takers on two of the tests, lower on one test, and did not significantly differ on the fourth test, these patterns mask substantial heterogeneity. A closer examination that incorporates birthplace as a mediating factor reveals several important findings for these children.

First, we present compelling evidence that the children of Hispanic immigrants both within and across generations quickly become English dominant. We find English dominance among children born in the U.S.; they experience over a one standard deviation test score disadvantage when randomly administered the tests in Spanish. These results are robust to various specifications, including a sibling fixed effects model that controls for observed and unobserved household characteristics that are constant across siblings. This contrasts with

previous work examining adults (Lazear, 1999) and suggests that children face a different incentive structure when presented with the decision to learn and use English.

Second, we show a rapid assimilation of English among the foreign born. Children who arrive in the U.S. at an early age or who have spent more than three years in the U.S. experience no advantage associated with taking the tests in Spanish. Both of these patterns challenge previous work showing that Hispanic immigrants are learning English more slowly than previous immigrant waves and more slowly than other origin groups (Alba et al., 2002).

Third, we show that foreign born children experience a test score disadvantage ranging from 0.71 to 1.50 standard deviations when randomly administered the test in English. If we consider this the bias of giving the test in English to foreign born children, this suggests significant implications for long-run academic and lifetime achievement. Children with lower test scores due to this bias may be subsequently tracked into less academically oriented classes and set up for a lower likelihood of economic success later in life. Given research demonstrating the positive correlation between early test scores and later academic and labor market outcomes, these findings provide key insight into a population that may face significant challenges.

Fourth, we show that for children of Hispanic immigrants born in the U.S., there is a nativity effect that impacts achievement test scores beyond English proficiency. For English proficient children (both U.S. and foreign born), there is not surprisingly an advantage to being given the test in English. However, limited English proficient, foreign born children experience a significant disadvantage when taking the test in English, but U.S. born children experience no significant difference if randomly given the test in English. We interpret this as evidence that for U.S. born children, despite having limited English proficiency, their exposure to American

society imparts a basic working knowledge of English or test taking skills that benefit them with the Woodcock Johnson achievement tests.

Fifth, the results indicate that children of Hispanic immigrants may be at greater risk of not experiencing the benefits of learning English and the subsequent socioeconomic mobility than children of immigrants from other regions. When given the test in English, foreign born children of Hispanic immigrants score worse than foreign born children from other regions. However, for second generation Hispanic children the test score gap is significantly reduced from the first generation case. Yet, despite the improvement for U.S. born children of Hispanic immigrants given the achievement tests in English, they continue to experience a small test score disadvantage compared to children of non-Hispanic immigrants and their language disadvantage may have lingering effects if not addressed.

Finally, our findings yield important policy implications. First, the rapid assimilation of English should assuage some of the fears associated with the immigrant waves in the latter half of the twentieth century. In fact, our results for Hispanics suggest a rapid loss of Spanish language proficiency. Second, a back of the envelope calculation using results from Fryer and Levitt (2004) indicates that approximately 12.3 percent of the Hispanic-white test gap in math and 37.0 percent in reading can be explained by this test score language bias. These results point to the importance of English language instructional help, particularly for Hispanic children who arrive in the U.S. at older ages. These children are the ones most likely to suffer from a test score language bias and for whom targeted language assistance could yield critical economic gains.

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Figure 1a: Passage Comprehension Test Scores, By Age at Arrival in the U.S. and Randomized Test Language

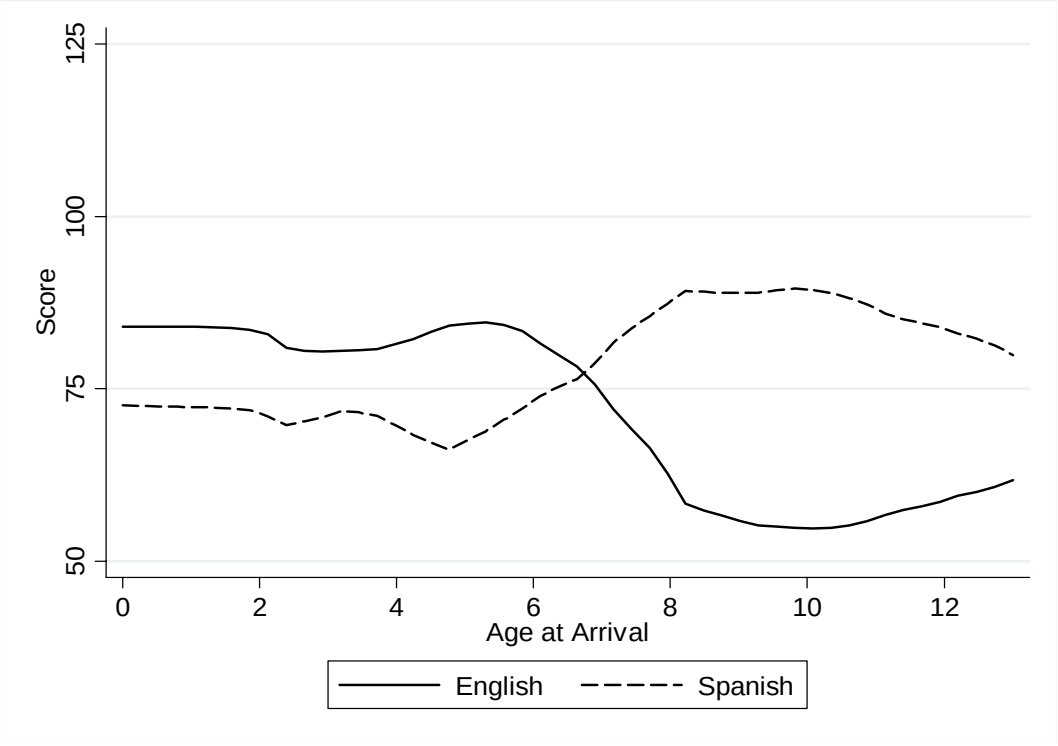


Figure 1b: Calculation Test Scores, By Age at Arrival in the U.S. and Randomized Test Language

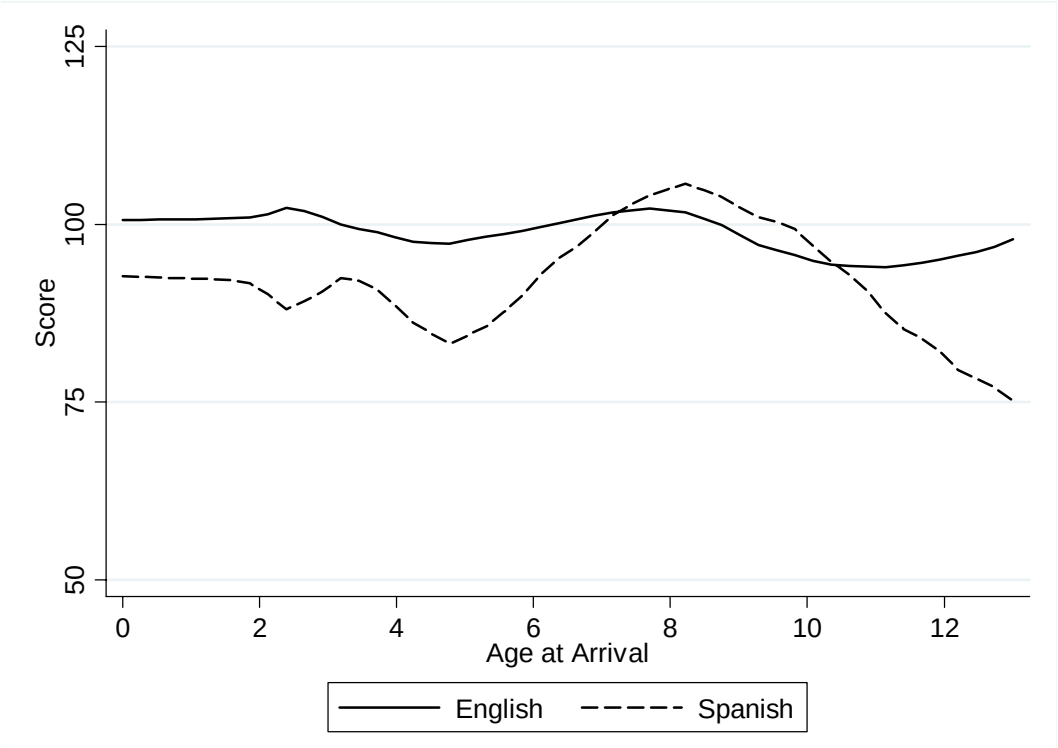


Figure 1c: Applied Problems Test Scores, By Age at Arrival in the U.S. and Randomized Test Language

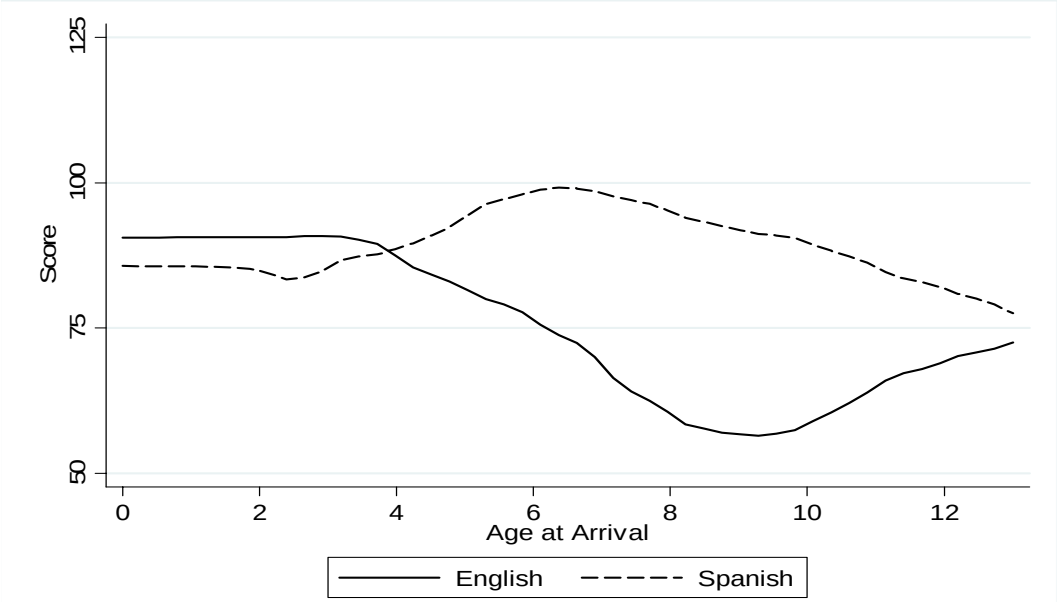
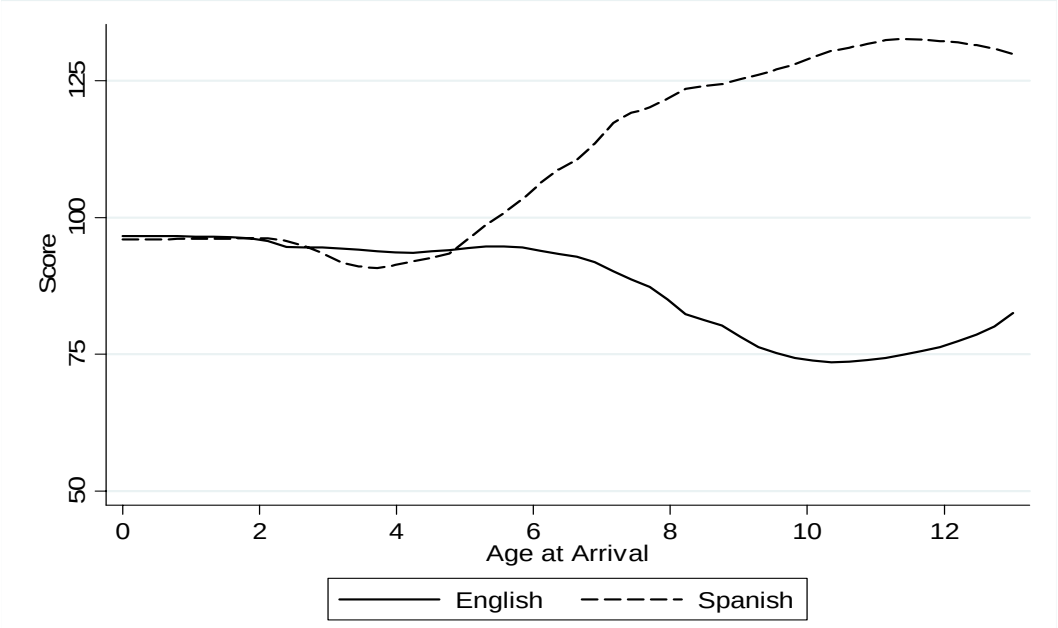


Figure 1d: Letter Word Identification Test Scores, By Age at Arrival in the U.S. and Randomized Test Language



Notes: Kernel-weighted local polynomial regression (using Epanechnikov kernel) of Woodcock Johnson achievement test scores on age at arrival in the U.S. Tests were randomly administered in English or Spanish to children of Hispanic immigrants. The Passage Comprehension and Calculation tests were administered to children ages 6 to 12 and the Applied Problems and Letter Word Identification tests were administered to children ages 3 to 12. Scores are normed by age based on national averages to have a mean of 100 and a standard deviation of 15. Data source: New Immigrant Survey 2003.

Figure 2a: Passage Comprehension Test Scores, By Years in the U.S. and Randomized Test Language

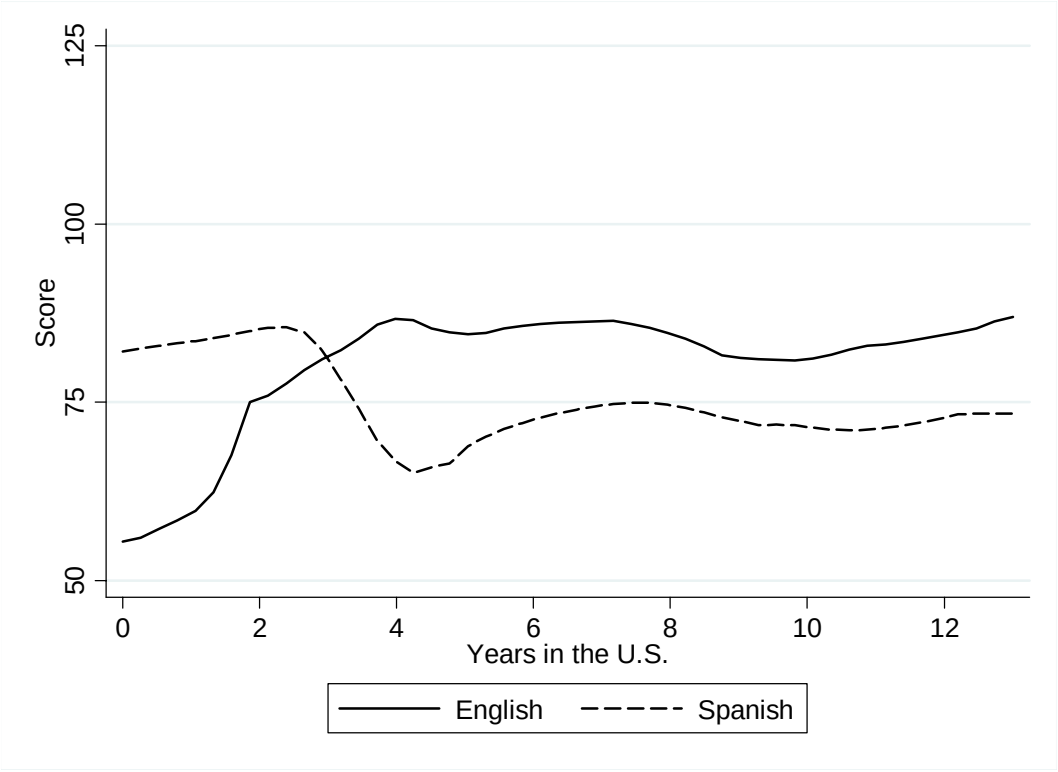


Figure 2b: Calculation Test Scores, By Years in the U.S. and Randomized Test Language

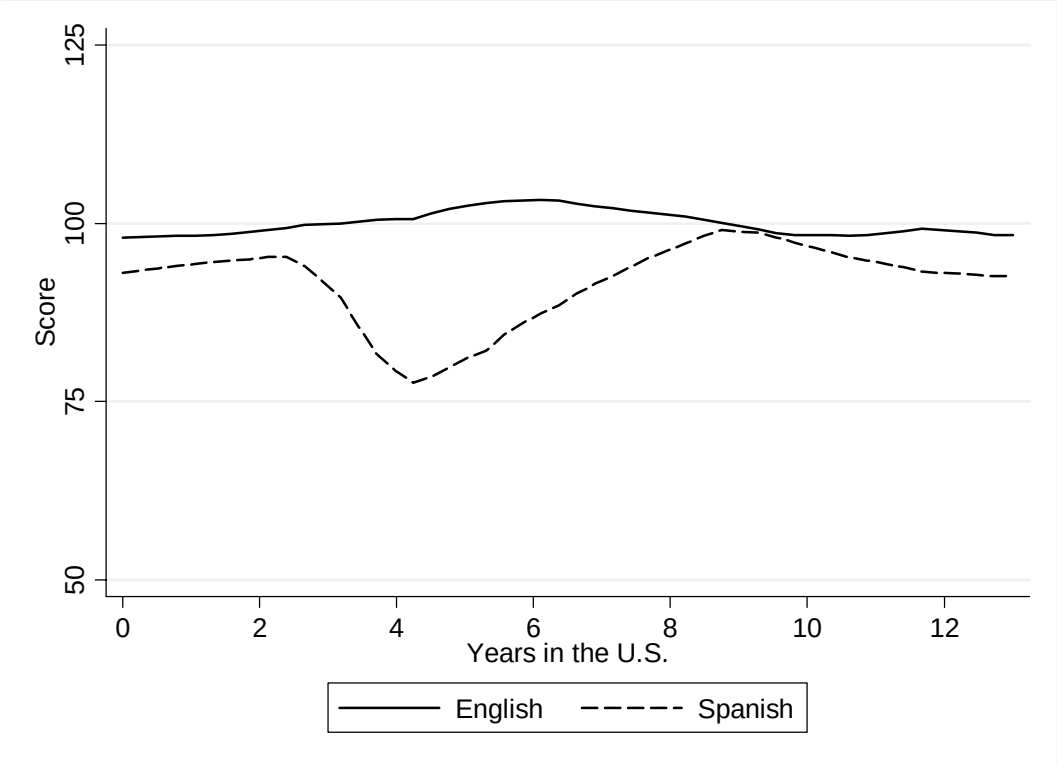


Figure 2c: Applied Problems Test Scores, By Years in the U.S. and Randomized Test Language

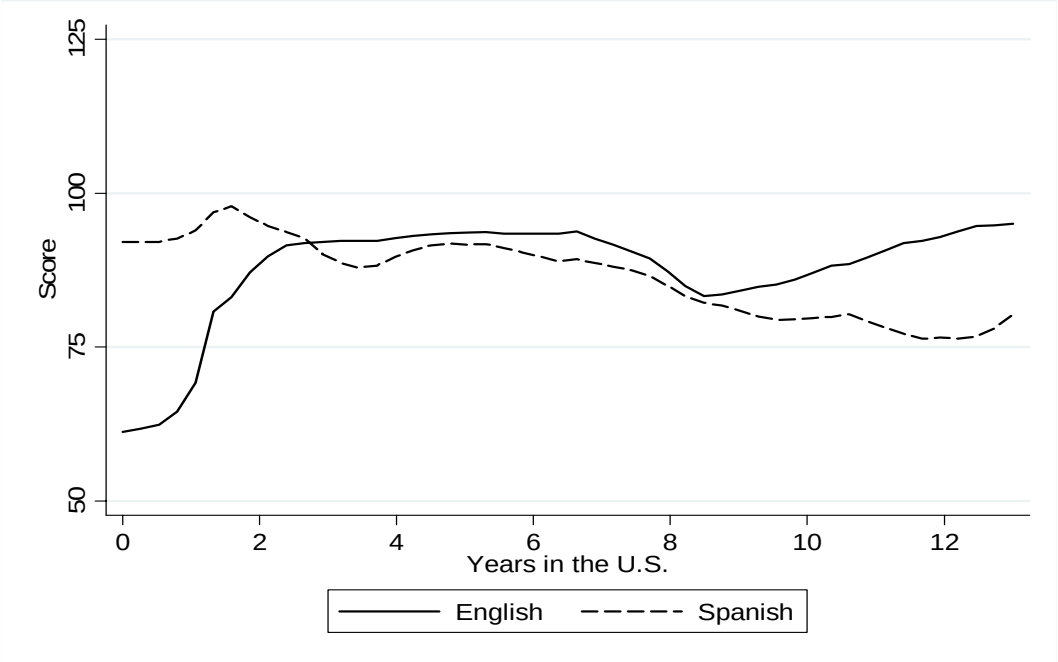
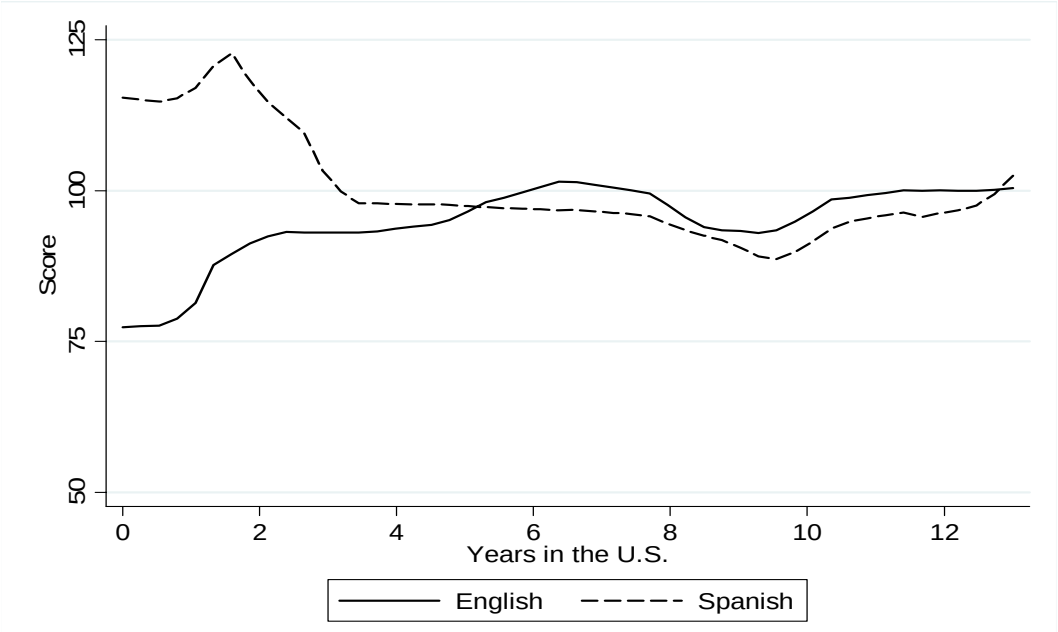


Figure 2d: Letter Word Identification Test Scores, By Years in the U.S. and Randomized Test Language



Notes: Kernel-weighted local polynomial regression (using Epanechnikov kernel) of Woodcock Johnson achievement test scores on years in the U.S. Tests were randomly administered in English or Spanish to children of Hispanic immigrants. The Passage Comprehension and Calculation tests were administered to children ages 6 to 12 and the Applied Problems and Letter Word Identification tests were administered to children ages 3 to 12. Scores are normed by age based on national averages to have a mean of 100 and a standard deviation of 15. Data source: New Immigrant Survey 2003.

Table 1: Sample Characteristics for Experiment Eligible Children,
By Randomized Test Language

	English	Spanish	Difference
	(1)	(2)	(1)-(2)
Fraction U.S. Born	0.803	0.781	0.022
	(0.398)	(0.414)	[0.027]
Child's Age at Arrival	1.479	1.533	-0.054
	(3.121)	(3.192)	[0.208]
Child's Number of Years in the U.S.	6.275	6.456	-0.181
	(3.536)	(3.684)	[0.238]
Child's Proportion of Life Spent in U.S.	0.824	0.824	0.0003
	(0.344)	(0.349)	[0.023]
Child's Years of Education	3.673	3.825	-0.152
	(2.250)	(2.344)	[0.160]
Child's Years of U.S. Education	3.236	3.378	-0.142
	(2.332)	(2.432)	[0.172]
Child's Age	7.752	7.987	-0.235
	(2.846)	(2.903)	[0.189]
English Spoken at Home (parent's report)	0.301	0.309	-0.008
	(0.459)	(0.463)	[0.030]
Female	0.466	0.529	-0.063*
	(0.500)	(0.500)	[0.033]
Parent's Years of Education	9.566	9.538	0.028
	(4.411)	(4.000)	[0.277]
Parent's English Proficiency	0.272	0.256	0.016
	(0.021)	(0.437)	[0.029]
Parent's Years of U.S. Experience	9.350	9.884	-0.534
	(6.789)	(6.802)	[0.447]
Number of children	472	452	

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%. Standard deviations are in parentheses and standard errors are in brackets. Woodcock Johnson achievement tests were randomly administered in English or Spanish to children of Hispanic immigrants. Data source: New Immigrant Survey 2003.

Table 2: Average Test Scores for Experiment Eligible Children, By Randomized Test Language

	English (1)	Spanish (2)	Difference (1)-(2)
Panel A			
Passage Comprehension	80.559	74.384	6.175***
	(21.561)	(29.734)	[1.976]
Calculation	100.137	92.862	7.275***
	(20.185)	(31.782)	[2.024]
Number of children	348	341	689
Panel B			
Applied Problems	87.209	86.611	0.598
	(23.180)	(25.539)	[1.603]
Letter Word Identification	94.665	99.411	-4.746***
	(19.665)	(29.919)	[1.659]
Number of children	472	452	924

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%. Standard deviations are in parentheses and standard errors are in brackets. Woodcock Johnson achievement tests were randomly administered in English or Spanish to children of Hispanic immigrants. The Passage Comprehension and Calculation tests were administered to children ages 6 to 12 and the Applied Problems and Letter Word Identification tests were administered to children ages 3 to 12. Scores are normed by age based on national averages to have a mean of 100 and a standard deviation of 15. Data source: New Immigrant Survey 2003.

Table 3: Average Test Scores by Randomized Test Language for Experiment and Non-Experiment Eligible Children

	Experiment-Eligible, Test in English (1)	Experiment-Eligible, Test in Spanish (2)	Non-Experiment Eligible, Test in English (3)	Difference (1)-(2)	Difference (3)-(1)	Difference (3)-(2)
Panel A: Foreign Born Only						
Passage Comprehension	70.128	80.837	82.771	-10.709***	12.643***	1.934
	(25.397)	(26.486)	(26.486)	[4.002]	[3.246]	[2.994]
Calculation	98.810	93.226	104.920	5.584	6.110**	11.694***
	(15.437)	(28.533)	(23.111)	[3.728]	[2.768]	[2.703]
Applied Problems	75.913	89.572	90.351	-13.659***	14.439***	0.780
	(30.897)	(21.434)	(27.577)	[3.819]	[3.035]	[2.861]
Letter Word Identification	89.052	111.591	100.012	-22.539***	10.961***	-11.578***
	(23.596)	(31.244)	(23.643)	[4.015]	[2.572]	[2.589]
Panel B: U.S. Born Only						
Passage Comprehension	83.328	72.174	89.277	11.154***	5.949***	17.103***
	(19.559)	(30.910)	(23.647)	[2.232]	[1.994]	[2.656]
Calculation	100.489	92.737	102.926	7.752***	2.437	10.189***
	(21.278)	(32.873)	(22.641)	[2.390]	[2.040]	[2.740]
Applied Problems	89.981	85.781	99.079	4.200**	9.098***	13.299***
	(19.952)	(26.544)	(22.480)	[1.728]	[1.550]	[1.824]
Letter Word Identification	96.042	95.995	106.160	0.0473	10.118***	10.165***
	(18.349)	(28.665)	(20.270)	[1.767]	[1.410]	[1.836]

Notes: Standard deviations in parentheses and standard errors in brackets. * significant at 10%, ** significant at 5%, *** significant at 1%. Woodcock Johnson tests were randomly administered in English or Spanish to children of Hispanic immigrants. Passage Comprehension and Calculation tests were given to children ages 6 to 12 and Applied Problems and Letter Word Identification tests were administered to children ages 3 to 12. Scores are normed by age based on national averages to have a mean of 100 and a standard deviation of 15. In Panel A for the foreign born children, there were 73 experiment eligible children who took Passage Comprehension and Calculation tests in English and 87 in Spanish, while 93 experiment eligible children took Applied Problems and Letter Word Identification tests in English and 99 in Spanish. There were 697 non-experiment eligible foreign born children who took Passage Comprehension and Calculation tests and 920 who took Applied Problems and Letter Word Identification tests. In Panel B for the U.S. born children, there were 275 experiment eligible children taking Passage Comprehension and Calculation tests in English and 254 in Spanish, while 379 experiment eligible children took Applied Problems and Letter Word Identification tests in English and 353 in Spanish. There were 197 non-experiment eligible U.S. born children who took Passage Comprehension and Calculation tests and 372 who took Applied Problems and Letter Word Identification tests. Data source: New Immigrant Survey 2003.

Table 4: OLS Regressions of the Determinants of Woodcock Johnson Achievement Test Scores

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Passage Comprehension				Panel B: Calculation			
Test in Spanish	10.709***	11.225***	11.636***	12.014***	-5.584	-4.999	-5.079	-4.894
	[4.034]	[3.966]	[3.854]	[3.810]	[3.554]	[3.328]	[3.440]	[3.261]
U.S. Born	13.199***	11.896***	12.018***	12.013***	1.679	1.162	1.650	1.034
	[3.249]	[3.641]	[3.548]	[3.799]	[2.159]	[2.714]	[2.888]	[3.154]
U.S. Born*Test in Spanish	-21.863***	-22.808***	-23.147***	-23.778***	-2.168	-2.527	-2.845	-2.707
	[4.678]	[4.636]	[4.511]	[4.481]	[4.280]	[4.106]	[4.140]	[4.023]
Constant	70.128***	71.668***	61.236***	65.882***	98.810***	72.688***	88.503***	67.626***
	[3.024]	[8.663]	[4.140]	[8.754]	[1.808]	[8.351]	[3.543]	[8.749]
Child Characteristics?	No	Yes	No	Yes	No	Yes	No	Yes
Parent Characteristics?	No	No	Yes	Yes	No	No	Yes	Yes
Number of Children [a]	689	677	687	677	689	677	687	677
	Panel C: Applied Problems				Panel D: Letter Word Identification			
Test in Spanish	13.659***	10.491***	13.959***	10.652***	22.539***	23.057***	23.299***	23.561***
	[3.734]	[3.680]	[3.635]	[3.641]	[4.216]	[4.525]	[4.011]	[4.368]
U.S. Born	14.068***	3.912	12.791***	3.651	6.990***	8.927**	10.834***	12.285***
	[3.465]	[3.422]	[3.607]	[3.703]	[2.668]	[3.471]	[3.224]	[3.880]
U.S. Born*Test in Spanish	-17.859***	-15.515***	-18.520***	-15.872***	-22.586***	-24.229***	-23.351***	-24.529***
	[4.149]	[4.254]	[4.075]	[4.216]	[4.612]	[5.057]	[4.455]	[4.956]
Constant	75.913***	75.262***	66.892***	71.503***	89.052***	82.135***	80.346***	78.844***
	[3.314]	[7.996]	[4.407]	[8.385]	[2.514]	[9.722]	[3.863]	[9.767]
Child Characteristics?	No	Yes	No	Yes	No	Yes	No	Yes
Parent Characteristics?	No	No	Yes	Yes	No	No	Yes	Yes
Number of Children [a]	924	768	921	768	924	768	921	768

Notes: Robust standard errors in brackets, clustered at the household level. * significant at 10%; ** significant at 5%; *** significant at 1%. Woodcock Johnson tests were randomly administered in English or Spanish to children of Hispanic immigrants. The Passage Comprehension and Calculation tests were given to children ages 6 to 12 and the Applied Problems and Letter Word Identification tests were given to children ages 3 to 12. Scores are normed by age based on national averages to have a mean of 100 and a standard deviation of 15. Child characteristics include birth year dummies, child's years of education, child's years of U.S. education, child's sex, and whether English is spoken at home (parent's report). Parent characteristics include parent's years of education, parent's English proficiency, parent's years of U.S. experience, and parent's years of U.S. experience squared. Data source: New Immigrant Survey 2003.

[a] Missing child and parent characteristics explain the reduced sample sizes for regressions in columns 2, 3, 4, 6, 7, and 8. Baseline regression results in columns 1 and 4 are consistent using the restricted samples.

Table 5: Quantile Regressions of the Determinants of Test Scores

Quantiles:	10^{th}	25^{th}	50^{th}	75^{th}	90^{th}
Panel A: Passage Comprehension					
Test in Spanish	18.529	21.283***	16.650***	3.089	5.062
	[17.025]	[5.651]	[5.399]	[3.356]	[4.256]
U.S. Born	21.930***	20.722***	16.565***	3.760	6.928**
	[6.242]	[4.512]	[5.202]	[2.867]	[3.201]
U.S. Born*Test in Spanish	-66.934***	-34.509***	-24.817***	-8.223**	-8.265*
	[20.645]	[6.849]	[5.726]	[3.714]	[4.997]
Constant	38.630***	54.156***	69.310***	91.891***	98.012***
	[5.670]	[4.167]	[5.066]	[2.780]	[2.620]
Panel B: Calculation					
Test in Spanish	-16.677	-6.959	-0.410	1.118	3.557
	[13.726]	[5.486]	[3.047]	[3.999]	[6.793]
U.S. Born	-1.545	4.502	3.265	3.230	4.513
	[4.480]	[3.235]	[2.127]	[2.462]	[4.776]
U.S. Born*Test in Spanish	-26.929*	-3.026	-1.368	1.485	-1.872
	[16.357]	[6.861]	[3.504]	[4.401]	[7.261]
Constant	79.760***	88.998***	98.774***	108.731***	118.154***
	[3.349]	[2.685]	[1.821]	[2.046]	[4.118]
Panel C: Applied Problems					
Test in Spanish	40.451***	25.312***	8.752*	2.345	-1.926
	[6.171]	[8.444]	[4.569]	[3.211]	[4.486]
U.S. Born	38.884***	25.287***	8.343*	2.944	3.160
	[5.670]	[8.209]	[4.528]	[2.821]	[3.344]
U.S. Born*Test in Spanish	-49.469***	-28.754***	-10.557**	-1.917	0.395
	[7.838]	[8.770]	[4.925]	[3.640]	[4.739]
Constant	30.045***	56.628***	83.369***	98.365***	108.291***
	[5.468]	[8.065]	[4.446]	[2.645]	[3.219]
Panel D: Letter Word Identification					
Test in Spanish	7.253	9.258*	23.493***	29.384***	29.932***
	[8.355]	[5.578]	[5.495]	[5.154]	[5.324]
U.S. Born	12.410**	8.355**	4.766*	0.345	1.483
	[5.938]	[4.141]	[2.700]	[4.013]	[4.514]
U.S. Born*Test in Spanish	-20.516**	-14.366**	-24.343***	-23.566***	-19.605**
	[9.814]	[6.058]	[5.787]	[5.513]	[6.686]
Constant	63.636***	76.897***	91.604***	106.693***	117.325***
	[5.863]	[3.897]	[2.563]	[3.834]	[4.091]

Notes: Robust standard errors in brackets, clustered at the household level. * significant at 10%; ** significant at 5%; *** significant at 1%. Woodcock Johnson achievement tests were randomly administered in English or Spanish to children of Hispanic immigrants. The Passage Comprehension and Calculation tests were administered to children ages 6 to 12 and the Applied Problems and Letter Word Identification tests were administered to children ages 3 to 12. Scores are normed by age based on national averages to have a mean of 100 and a standard deviation of 15. There are 689 children in the quantile regressions in Panels A and B and 924 children in the quantile regressions in Panels C and D. Data source: New Immigrant Survey 2003.

Table 6: Sibling Fixed Effects Estimation of the Determinants of Test Scores

Dependent Variable:	Passage Comprehension (1)	Calculation (2)	Applied Problems (3)	Letter Word Identification (4)
Test in Spanish	12.889**	-12.996**	17.765***	28.229***
	[6.234]	[5.501]	[5.652]	[5.637]
U.S. Born	13.381**	0.258	21.919***	19.727***
	[6.100]	[6.310]	[5.136]	[6.684]
U.S. Born*Test in Spanish	-18.401**	4.608	-22.747***	-29.228***
	[7.303]	[6.331]	[6.289]	[6.245]
Constant	67.634***	101.071***	69.552***	78.715***
	[5.194]	[4.983]	[4.408]	[5.449]
Number of Children	689	689	924	924

Notes: Robust standard errors in brackets, clustered at the household level. * significant at 10%; ** significant at 5%; *** significant at 1%. Woodcock Johnson achievement tests were randomly administered in English or Spanish to children of Hispanic immigrants. The Passage Comprehension and Calculation tests were administered to children ages 6 to 12 and the Applied Problems and Letter Word Identification tests were administered to children ages 3 to 12. Scores are normed by age based on national averages to have a mean of 100 and a standard deviation of 15. Data source: New Immigrant Survey 2003.

Table 7: OLS Regressions of the Determinants of Test Scores, by Age at Arrival in the U.S., Years in the U.S., and Percent of Life in the U.S.

Dependent Variable:	Passage Comprehension	Calculation	Applied Problems	Letter Word Identification
Panel A: Age at Arrival in the U.S.				
Test in Spanish	-12.350***	-7.810***	-5.038***	-1.925
	[2.277]	[2.374]	[1.783]	[1.913]
Age at Arrival	-2.195***	-0.312	-2.567***	-1.550***
	[0.350]	[0.245]	[0.446]	[0.374]
Test in Spanish*Age at Arrival	3.394***	0.299	2.987***	4.406***
	[0.499]	[0.486]	[0.510]	[0.524]
Constant	84.495***	100.697***	91.006***	96.957***
	[1.220]	[1.261]	[1.054]	[0.972]
Number of Children	689	689	924	924
Panel B: Years in the U.S.				
Test in Spanish	13.289***	-11.366***	17.596***	23.980***
	[4.530]	[4.334]	[3.112]	[3.394]
Years in the U.S.	1.920***	-0.076	1.503***	1.461***
	[0.339]	[0.268]	[0.357]	[0.258]
Test in Spanish*Years in the U.S.	-2.674***	0.557	-2.860***	-3.020***
	[0.532]	[0.509]	[0.442]	[0.505]
Constant	66.640***	100.685***	77.775***	85.498***
	[2.806]	[2.134]	[2.776]	[1.974]
Number of Children	689	689	924	924
Panel C: Percent of Life in U.S.				
Test in Spanish	20.727***	-5.153	24.676***	35.180***
	[4.783]	[4.435]	[4.097]	[4.432]
Percent of Life in U.S.	0.228***	0.025	0.237***	0.146***
	[0.034]	[0.026]	[0.041]	[0.031]
Test in Spanish * Percent of Life in U.S.	-0.331***	-0.026	-0.307***	-0.369***
	[0.055]	[0.052]	[0.047]	[0.049]
Constant	61.939***	98.068***	67.666***	82.606***
	[3.081]	[2.161]	[3.834]	[2.858]
Number of Children	689	689	924	924

Notes: Robust standard errors in brackets, clustered at the household level. * significant at 10%; ** significant at 5%; *** significant at 1%. Woodcock Johnson achievement tests were randomly administered in English or Spanish to children of Hispanic immigrants. The Passage Comprehension and Calculation tests were administered to children ages 6 to 12 and the Applied Problems and Letter Word Identification tests were administered to children ages 3 to 12. Scores are normed by age based on national averages to have a mean of 100 and a standard deviation of 15. Data source: New Immigrant Survey 2003.

Table 8: OLS Regressions of the Determinants Test Scores, by English Proficiency and Birthplace

	Foreign Born				U.S. Born			
	Passage Comprehension	Calculation	Applied Problems	Letter Word Identification	Passage Comprehension	Calculation	Applied Problems	Letter Word Identification
Test in Spanish	23.562***	-6.863	27.006***	42.190***	-7.271	-5.682	-0.021	3.683
	[5.369]	[4.895]	[5.392]	[5.532]	[4.657]	[5.030]	[4.533]	[4.686]
English Proficient	30.191***	-0.490	34.211***	30.131***	5.877**	2.538	6.273**	7.056**
	[5.613]	[5.008]	[6.427]	[5.222]	[2.826]	[2.986]	[3.117]	[2.788]
English Proficient*	-29.747***	9.835	-38.530***	-37.408***	-5.952	1.584	-9.190*	-9.184
Test in Spanish	[7.267]	[7.462]	[8.113]	[8.650]	[5.627]	[6.085]	[5.517]	[5.681]
Constant	58.256***	98.745***	62.377***	78.233***	79.564***	97.963***	84.857***	92.806***
	[3.884]	[2.485]	[5.220]	[3.837]	[2.128]	[2.217]	[2.530]	[2.251]
Observations	126	126	129	129	360	360	385	385

Notes: Robust standard errors in brackets, clustered at the household level. * significant at 10%; ** significant at 5%; *** significant at 1%. Woodcock Johnson achievement tests were randomly administered in English or Spanish to children of Hispanic immigrants. The Passage Comprehension and Calculation tests were administered to children ages 6 to 12 and the Applied Problems and Letter Word Identification tests were administered to children ages 3 to 12. Scores are normed by age based on national averages to have a mean of 100 and a standard deviation of 15. Data source: New Immigrant Survey 2003.