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LATINO STUDENTS' MATH LEARNING TRAJECTORIES IN THE EARLY SCHOOL YEARS: THE ROLE OF ENGLISH ABILITY AND SOCIOECONOMIC STATUS

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ABSTRACT

The rapid Hispanic population growth is significantly impacting the overall U.S population. In addition, Hispanics are over-represented among individuals living in poverty and are considered a high-risk group within schools.

During the past twenty years, research has emphasized the relevance of the early school years for future life chances and learning experiences (Entwisle & Alexander, 1988; 1993; Cunningham & Stanovich, 1997; Farkas & Beron 2001). First grade children learn ten times more than high school students (Jencks, 1985), they show positive dispositions toward learning (Entwisle & Alexander, 1994), and the literacy and numeric skills acquired during this period are strong predictors of school achievement years later (Cunningham & Stanovich, 1997; Farkas & Beron, 2001). The early school years may be even more critical for Hispanic children who are predominantly children with foreign-born parents and are often raised in non-English speaking homes.

This study, taking a longitudinal approach, uses the ECLS-K database to examine Hispanic students' math learning trajectories between kindergarten and third grade. Specifically, this study describes Hispanic students' math achievement patterns by Hispanic country of origin and generational status. In addition, I investigate the relative importance of English ability and SES in shaping their learning trajectories. A piecewise linear growth model is used to estimate learning growth during kindergarten, in first grade, and between first and third grade. Hierarchical Linear Modeling is used to analyze two-level models –assessments nested within students.

This study finds important variability in math outcomes among Hispanic subgroups; variability that is generally masked when Hispanics of different countries of origin and generations are aggregated within one pan-ethnic denomination. Overall, Hispanic students could be clustered into two distinct groups. First and second generation Mexican students, Puerto Rican students regardless of generation, and Central American students regardless of generation are included in the first group. These students start kindergarten with significant math disadvantages that persist until third grade. The second group includes third+ generation Mexican, Cuban and South American students. This group show modest differences in average math scores at Kindergarten entry and similar growth rates between kindergarten and third grade.

Moreover, SES and English ability effects on educational outcomes vary across school grades and Hispanic subgroup. For instance, English ability alone is crucial in explaining math achievement gaps between White students and Cuban and South American students. English ability is also more important in explaining math achievement gaps at kindergarten entry and during kindergarten. In contrast, SES is essential in explaining Mexican – White students' math achievement gaps during first grade and from first to third grade.

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CHAPTER 1

INTRODUCTION

Motivation and Background

The rapid growth of the Latin Population (14.6 million individuals in 1980 to 35.3 million in 2000) is significantly impacting the overall U.S population. It is predicted that by 2025, Hispanics will account for 25% of the population (Martin and Midgley 1999; Martin and Midgley 2003). Within U.S schools, Hispanic students are considered a high-risk group because their educational outcomes, such as kindergarten readiness, educational achievement and attainment, lag far behind other racial/ethnic groups (Hirschman 2001; Lee and Burkham 2002; Van Hook and Stamper Balistreri 2002; Fry 2003; Kao and Thompson 2003; National-Center-for-Education-Statistics 2003; Reardon 2003; Rumberger and Arellano 2004). The educational gaps are especially problematic because they are intrinsically related to social and economic inequalities (Manning and Baruth 2004). Moreover, research on disadvantaged populations has largely focused on Black students (Reardon 2003; Rumberger and Arellano 2004), and lesser attention has been paid to the Hispanic students' specific needs and challenges.

Although Hispanics in the U.S are a mixture of very different peoples, they are often considered a single group. Regarding their origins, for example, some Hispanics come from different Latin American countries and have different ancestries.

They are also diverse based on their time of arrival in the U.S and their generational status at the time of arrival. Hispanics' generational status are classified as, first generation – those who are foreign-born with foreign-born parents; second generation – those who are U.S born with at least one foreign-born parent; and third^{+} generation – those who are U.S-born to U.S-born parents and have never been immigrants.

In spite of the foregoing, the term "Hispanic" is broadly used by local and federal employment agencies in classifying all Spanish speaking people for the purposes of the U.S Census and for business market researches, thereby ignoring the diversity within this group. To illustrate, Mexicans and Cubans present part of the complexities within the Hispanic groups. Portes & Rumbaut (2001) and Grosfoguel (1999) found that, in general, people who identified themselves as Mexicans arrived to the U.S. with fewer economic resources and had low levels of formal education that put them at an initial disadvantage that is likely to remain over time. In contrast, Cuban immigrants tend to be better educated and to attain upward mobility shortly after their arrival in the U.S (Grosfoguel 1999; Portes and Rumbaut 2001). Therefore, blending these two different groups as a pan-ethnic group contributes to contradictory conclusions regarding Hispanics' educational achievement.[1]

During the past twenty years, research has emphasized the relevance of the early school years to future life chances and learning experiences (Entwisle and Alexander 1989; Entwisle and Alexander 1993; Farkas and Berton 2001; Reardon 2003). To illustrate, first grade children learn more than high school students (Jencks and Phillip

[1] In reporting my research, I use the terms "Latinos" and "Hispanics" interchangeably, however, it is important to mention that my personal preference is to use the Latino term. Regardless, the U.S. government's official label for this population is Hispanic.

1998), show positive dispositions toward learning (Entwisle and Alexander 1993), and their acquired literacy and numeric skills are strong predictors of their future educational achievement (Farkas and Berton 2001).

Given the foregoing, the initial school years are therefore crucial for children in constructing their identity as students, and in internalizing adults' expectations. Also during this period, they learn to navigate in a new formal setting and become part of a stratification process through teachers' expectations and sorting mechanisms, such as, ability grouping, special education and retention (Entwisle and Alexander 1988; Entwisle and Alexander 1993; Alexander, Entwisle et al. 1994).

The early school years may be even more important for Hispanic children who are predominantly children with foreign-born parents, and are often raised in non-English speaking homes. These years coincide with the processes of English language acquisition for many Hispanic students. At the same time that Hispanic students may be dealing with initial exposure to formal English (August and Hakuta 1997), they also have to cope with underachiever and deficit stereotyping, grouping mechanisms due to language barriers (Schmid 2001), and unfamiliar formal institution such as public schools. In sum, for many Hispanic students, initial educational experiences not only involve the typical home to school transition, but also important cultural and language transitions (Garcia 2001).

Aims of the Study

This research illuminates current discussions on race/ethnic educational inequalities by focusing on Latino students' math outcomes in the early school years. I describe average Hispanic students' math learning trajectories, investigate math achievement differences among Hispanic subgroups, and analyze whether these differences are related to differences in immigration processes (e.g. selection effects, context of reception, etc), socioeconomic status (hereafter SES), and students' English ability.

The main objectives of this study are:

1) To describe the average Hispanic students' math learning trajectories in the early school years and how math achievement patterns differ among Hispanic subgroups. For this purpose, I analyze differences in math knowledge at kindergarten entry and in growth rates during kindergarten, first grade, and from first to third grade. Hispanic subgroups are disaggregated by country or origin and generational status and classified as Mexicans, Puerto Ricans, Cubans, South Americans, Central Americans or Other Hispanics. Further, Hispanic students are classified as: 1) First generation students – foreign-born with foreign-born parents; 2) second generation students – native-born to foreign-born parents; and 3) third generation individuals – native-born to native-born parents of Hispanic origins. For comparison, I contrast math outcome differences between Hispanic subgroup students and native non-Hispanic White and native non-Hispanic Black students (hereafter referred to as Black and White). By comparing Hispanic students' math outcomes to those observed for Black and White students, I frame my discussion

within broader patterns of racial/ethnic educational inequality.

2) To analyze whether Hispanic students' math achievement outcomes are related to SES and English ability, I study the effect of these explanatory variables on Hispanic students' math knowledge at kindergarten entry and in their growth rates during each time period. Thus, I not only investigate the relative importance of these variables for math outcomes, but also I identify different effects on math outcomes for each time period.

The data for this study comes from the Early Childhood Longitudinal Study – Kindergarten Cohort (ECLS–K). To estimate an average math score at kindergarten entry and three growth rates, I use a longitudinal approach, analyzing math test scores obtained in five points of time – fall 1998, spring 1999, fall 1999, spring 2000, and spring 2002. A piecewise linear growth model is used to estimate learning growth during kindergarten, in first grade, and between first and third grade. Hierarchical Linear Modeling is used to analyze two-level models –assessments nested within students.

Dissertation Outline

This dissertation is organized as follows: in Chapter 2, I define the context of my research by describing the Latino population in the U.S and their immigration experiences. In this chapter, I emphasize the importance of the Latino population and the relevance of incorporating Hispanics' immigration processes and characteristics for understanding Latino children's educational outcomes.

In Chapter 3, I discuss different theoretical perspectives commonly applied to explain Hispanic students' educational outcomes. I analyze immigrant assimilation theories and cultural arguments, and review recent empirical findings about the role of students' English ability and SES on shaping Hispanic students' educational outcomes. Because neither of the previous theories fully explains existing evidence of Hispanic students' educational outcomes, I draw on school effect literature to elaborate on alternative explanations.

Chapter 4 includes the main research questions of my research. I also elaborate of my research and its importance.

In Chapter 5, I present my analytical sample, the ECLS-K study variables, and the methodological approach I use to answer my research questions.

The results of my research are presented in Chapters 6 and 7. In Chapter 6, I present Hispanic students' average math scores at kindergarten entry as well as math growth rates in kindergarten, first, and from first to third grade. I pay particular attention to differences related to country of origin, and when data allows, to generational status. In addition, Hispanic students' math outcomes are compared with those of White and Black students.

In Chapter 7, I analyze overall English ability and SES effects on average math scores at kindergarten entry, and math growth rates from kindergarten to third grade. Also, I discuss the relative importance of these variables in explaining Hispanic students' math outcomes.

I conclude with Chapter 8, where I synthesize and interpret the main findings of my research. Here also, I present theoretical and policy implications, outline limitations of my study, and discuss future possibilities for research.

CHAPTER 2

LATINOS IN THE U.S. AND THEIR IMMIGRATION EXPERIENCES

According to the 2000 U.S Census, Hispanics are "individuals of Mexican, Puerto Rican, Cuban, South American, Central American, and other Spanish culture or origin regardless of race" (U.S.-Census-Bureau 2000). Mexicans, Puerto Ricans, Cubans, and recently, South and Central Americans are the Latino groups most commonly studied in federal publications and academic research. Increasing numbers of individuals from these countries immigrate each year to the U.S generating important changes in U.S demographics. Furthermore, the geographical closeness and the economical or political unrest in most of these Latin countries suggest that the immigration flow will continue over time.

In this chapter, I define the context of my research and set the framework for interpreting Latino students' educational outcomes. Specifically, I describe the Latino population in the U.S, its characteristics, and their educational outcomes. I conclude this chapter with a discussion on Latino immigration experiences because of its important implications for Latino children's educational outcomes, given that each generation represents different waves of immigration with diverse SES and English ability characteristics.

Latinos in the U.S: Demography

The rapid growth of the Latino population is significantly impacting the overall U.S population. Latinos are replacing Blacks as the largest minority as the 2000 U.S Census documented 35,238,481 Latinos living in the U.S. mainland (Ramirez 2004). Between 1990 and 2000, the Latino population grew 58% (Guzman and McConnell 2002) accounting for 12.5% of the total U.S population in 2000 (U.S.-Census-Bureau 2000), and more than half of the foreign-born population in 2002 (Martin and Midgley 2003). By 2025, it is predicted that Latinos will account for 25% of the population while Whites and Blacks will account for 52% and 13% respectively (Martin and Midgley 1999; Martin and Midgley 2003).

The Latino population is younger than any other racial/ethnic population in the U.S. The proportion of Hispanics under the age of 35 is higher than the proportion for the total U.S population (Ramirez 2004), with 33% of Hispanics under age 18; compared to 24% of non-Hispanic Whites (U.S.-Census-Bureau 2000).

The Latino growth in the school-age population is greater than in the overall population (IUPLR 2002). In the past 20 years, the Latino school-age population has grown by 150% (U.S. Department of Education, 2000). Latinos now account for 16.2% of the school-age population (IUPLR 2002). The foreign-born Latino school-age population is particularly significant with approximately 49% being foreign-born or first generation (Larsen 2004).

However, it is essential to remember that Latinos are not a homogenous group. According to the 2000 U.S Census, there are eight Hispanic groups representing Latino

diversity in terms of country of origin. Mexicans and Puerto Ricans have the most significant presence in the U.S. Mexicans are by far the most predominant, representing 58.5% of the Latino group (Guzman 2001) and 30% of the U.S foreign-born population (Martin and Midgley 2003).

Puerto Ricans account for 9.6% of Latinos in the U.S mainland (Guzman 2001), although almost half of Puerto Ricans have lived in the U.S mainland at some point in time (Nieto 2000). In spite of being U.S citizens, Puerto Ricans are commonly studied as immigrants because they often face similar adaptation difficulties as other Latin American immigrants (Oropesa and Landale 2000).

Central Americans, including Dominicans, make up for 7% of the Latino population and 6% of the foreign-born population. Cubans represent 5% of Latinos and 3% of the U.S foreign-born population. South Americans represent 4% of Latinos and 6% of the U.S foreign-born population (Guzman 2001; Larsen 2004). All "Other Latinos" constitute the remaining 17.6%. "Other Latinos" include Spaniards and those who consider themselves Latinos even though they do not have Mexican, Puerto Rican, Cuban, South or Central American origins. The main demographic characteristics of the Latino population in the U.S are presented in Table 2.1.

Table 2.1

Main Demographic Characteristics of the Latino population in the U.S

	Total	Mexican	Puerto Rican	Cuban	Central American	South American	Dominican	Other
Population 1990	22,354,059	13,680,684	2,704,841	1,072,994	1,341,244	1,050,641	536,497	1,855,387
% of the Hispanic Population		61.2	12.1	4.8	6	4.7	2.4	8.3
Population 2000	35,238,481	20,900,102	3,403,510	1,249,820	1,811,676	1,419,979	799,768	5,540,627
% of the Hispanic Population		59.3	9.7	3.5	5.1	4	2.3	15.7
% of Increase 90-00	57.64	52.77	25.83	16.48	35.07	35.15	49.07	198.62
% Population Under 18	34.8	37.1	33.6	18.3	24.8	21.8	29.4	38.3
% Foregin-born entry in 2000	45.8	48.7	43.3	26.4	44.6	47.2	42.6	41.9
% Only Enlgish spoken Home	21.4	21.2	24.6	13.7	8.5	10.5	7.1	31.3
% HS or less (25 older)	47.2	54.2	36.7	37.1	54	23.9	48.9	40
% Bachelor Degree o +	10.4	7.5	12.5	21.2	9.5	25.2	10.9	11.2
Median Family Income	34397	33516	32791	42642	34150	42824	28729	34704
% Under poverty line (all ages)	22.6	23.5	25.8	14.6	19.9	15	27.5	21.5
% Under poverty line (under 18 years)	27.8	28.4	32.9	15.9	23.9	17.1	35.2	26

Sources: Ramirez, R. (2004). We the People: Hispanics in the United States. Washington DC, U.S. Census Bureau; and Guzman, B. and E. McConnell (2002). "The Hispanic Population: 1990-2000 growth and change." Population Research and Policy Review **21**(1-2): 109-128.

In addition, during the 1990s, the Latino population in the U.S experienced different growth rates by country of origin. Between 1990 and 2000, Central and South American populations increased by 35% (Guzman and McConnell 2002) of which only 23% were U.S born (Ramirez 2004). The Mexican population more than tripled between the 70s and 90s, growing from 4.5 to 13.5 million (Rumbaut 1995), and increased by 53% between 1990 and 2000 (Guzman and McConnell 2002). In contrast, Puerto Rican and Cuban populations experienced lower rates of growth – 25% and 19% respectively during the same time period (Guzman 2001).

In sum, Latinos represented 12.5% of the overall U.S population in 2000, and it is expected that they will account for 25% of the U.S. population by 2025. Within the Latino group, Mexicans have the largest majority followed by "Other Latinos," and Puerto Ricans. Central Americans including Dominicans, South Americans, and Cubans have the smallest numbers, with less than 7% for each group. Nevertheless, between 1990 and 2000, both Central and South American population growth rate has been very high and they are likely to have an important impact in the near future (Zalaquett 2002).

Educational Attainment and Achievement

Hispanic children's education has been a concern among educators and policymakers. Hispanics have the lowest rates of school readiness, high school completion, college enrollment, and college completion than any race/ethnic group. The Education Trust (2001), based on Census 2000 data, estimated that out of every 100 Latino students who began kindergarten, 62 graduated from high school, 29 achieved

some college education, and only 6 graduated from college. For Black and White students, the figures for high school graduation are 87 and 91, and 16 and 30 for college graduation respectively.

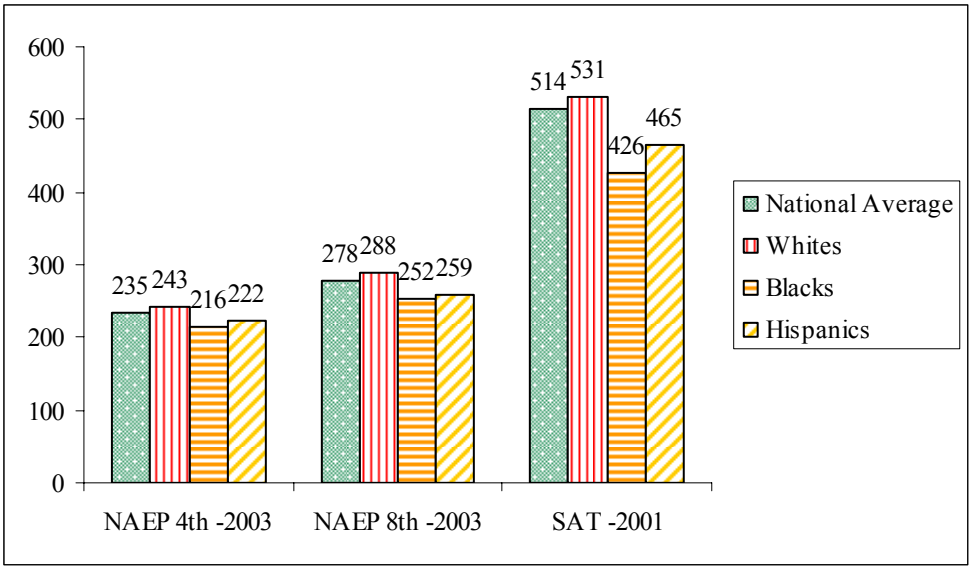
Although during the past 30 years Latino students experienced important educational gains, significant educational gaps in indicators such as kindergarten readiness, educational achievement, and attainment persist between Latinos and Whites students (Kao and Thompson 2003; National-Center-for-Education-Statistics 2003; Rouse, Brooks-Gun et al. 2005). For some indicators, these gaps are also observed between Latino and Black students.

Latinos have lower levels of children's school readiness at kindergarten than White and Black children combined (Zill, Collins et al. 1995; Reardon 2003; Rumberger and Arellano 2004; Rouse, Brooks-Gun et al. 2005). Children's school readiness is defined as those basic cognitive, social and emotional skills critical for learning (Rouse, Brooks-Gun et al. 2005). Lack of school readiness has been linked to type of childcare arrangements (Magnuson and Waldfogel 2005). For example, Latino parents are more likely to care for their children at home or use relatives as caregivers than White or Black parents (Capizzano, Adams et al. 2000). Also, White and Black children are more likely than Latino children to participate in educational programs before kindergarten (Magnuson and Waldfogel 2005). Only 40% of Latino children between 3 and 5 years old participate in center-based care or educational programs. For White and Black children, this percentage increases to 60% and 64% respectively (ERIC-Clearinghouse-on-Urban-Education 2001).

Further, measured through test scores, Latino students have lower levels of educational achievement than White students. As Figure 2.1 shows, Latino students persistently perform below national averages in National Assessment of Educational Progress (NAEP); showing a bigger gap by the end of their schooling than in earlier grades. Similar bigger gaps over time are found in other research. For instance, Garcia (2001) found that even though by 3rd grade Latino and White students are equally likely to be below grade level, by 8th grade 28.8% and 40.3% of Whites and Latinos respectively are below grade level. Also, by the time Latinos reach 12th grade, their writing and reading skills correspond to those of 13 year old White students (Weiss 2004). Differences in writing skills are mainly complex thinking abilities rather than mastering basic skills. College entrance exams, also clearly show achievement differences, where Latinos are less likely to get high scores in SAT exams than White students (U.S.-Council-of-Economic-Advisers 2000).

Figure 2.1

Average NAEP and SAT math scores by Race/Ethnicity



Sources: NCES (2003). The Nation's Report Card: Mathematics Highlights and NCES (2001) Digest for Educational Statistics Tables and Figures

In addition to having lower levels of educational attainment than White and Black students, Latinos have lower high school graduation and higher dropout rates (Hirschman 2001; Kaufman and Chapman 2001; Fry 2003). The high school completion rate for Latinos is 63%, compared to 81% and 90% for Black and White students (Padrón, Waxman et al. 2002). During 1998, among individuals between 16 and 24 years old, dropout rates were 30% for Latinos, 8% for Whites, and 14% for Blacks (Kaufman and Chapman 2001). When individuals between 16 and 19 years old were studied, dropout rates for Latinos decreased to 21% while the percentages for Black and White students remained similar as those observed for individuals between 16 and 24 years old (Fry 2003). Even though dropout estimators vary, Hispanics' dropout rates double Whites' dropout rates.

In fact, Latinos are less likely to attend and graduate from college (Van Hook and Stamper Balistreri 2002), and are more likely to be enrolled in two-year colleges than four-year colleges (Pew-Latino-Center 2004). Only a third of Latinos enroll in college and only 10% are college graduates (Padrón, Waxman et al. 2002). In contrast, the percentages of college graduates for White and Black students are 30% and 17% respectively (Stoops 2004).

Research shows significant variability in educational outcomes among Latino groups. Evidence suggests that children of Mexican and Central American origins have worse educational outcomes than children from any other Latino group. Mexicans and Central Americans have lower levels of educational attainment. Approximately 54% of Mexicans and Central Americans older than 25 years have a high school education

(Ramirez 2004). Also, students from these Hispanic groups have school dropout rates of 34% and 36% respectively (Garcia 2001).

In particular, Mexican students are less likely to be enrolled in school than students from any other Latino group (Hirschman 2001). Around 25% of 16 to 19 years old Mexicans are not enrolled in schools and have not finished high school (Lowell and Suro 2002). A higher percentage of Mexicans completed only nine years of education (U.S.-Census-Bureau 2000).

Among Central Americans, we observe two contradictory trends. Guatemalan, Honduran, and Salvadoran adolescents between 16 and 19 years old have lower school enrollment rates than their Mexican counterparts. In contrast, Panamanian, Costa Rican, and Dominican students' enrollment rates are significantly higher than those observed for Mexicans (Pew-Latino-Center 2003).

Among all Latinos, Cubans and South Americans have the best educational outcomes. Dropout rates for these students are 12% (Pew-Latino-Center 2003). Approximately 22% and 25% of Cubans and South Americans have at least a bachelor degree (Larsen 2004; Ramirez 2004). In addition, Cubans are less likely to drop out of school between 8^{th} and 10^{th} grades, and have higher reading grades than Mexicans and Puerto Ricans (Driscoll 1999; Pong 2003).

Differences in Hispanic students' educational outcomes are also related to their immigrant status although empirical evidence show mixed findings on this issue (Matute Biachi 1986; Kao and Tienda 1995; Suárez-Orozco 1995; Landale, Oropesa et al. 1998; Portes and Rumbaut 2001; Zhou 2001). First generation Hispanics, for instance, are equally likely as second generation students to drop out between 8^{th} and 12^{th} grades

(Driscoll 1999), but are less likely to complete high school and college, and have lower school attainment levels (Rong and Grant 1992) than do second generation Hispanics.[2] Additionally, first generation Mexican, Puerto Rican, and Central American dropout rates are 39%, 22% and 25% respectively, compared to 15%, 12% and 3% for their native born counterparts (Fry 2003).

Some research show that U.S-born Hispanics have higher tests scores but lower GPA than foreign-born Hispanics (Portes and Rumbaut 2001), though Kao and Tienda (1995) find no generational differences among 8th grade Hispanics in GPA and test scores. Pong (2003) supports Kao and Tienda (1995) findings, discovering similar patterns of no generational differences across Hispanic subgroups with reference to math school grades. Further, ethnographic studies on Mexican origin students show that those identified as "Mexican oriented" were more successful in school – in terms of grades, disposition toward learning, and effort – than those students identified as Mexican American (Matute Biachi 1986; Suárez-Orozco 1995). Mexican oriented students are first or second generation students while Mexican Americans are third generation students. Rumbaut (1995) identified similar patterns among San Diego High School students. Hispanic English speakers (proxy for third generation) have lower grades than limited English and fluent English proficient students (proxies for first and second generations respectively) (Rumbaut 1995).

[2] Similar patterns are found when I compare second and third generation students except for college completion. Second generation Hispanics are more likely to complete college than third generation Hispanics (Rong & Grant, 1992).

Immigration Experiences by Country of Origin

Immigration is a major contributor to U.S population growth. To illustrate, during the 90s, 30% of the U.S population growth was attributable to immigration and it is predicted that the same demographic process will account for two thirds of the population growth by 2050 (National Research Council, 1997). In 1997, one in five children in the U.S had immigrant families, and most immigrant descendents were school-age children (Jensen and Chitose 1994; Portes and MacLeaod 1996).

The growth of the Latino population in the U.S has also been principally related to U.S immigration from various Latin American countries. The beginning of the Latino immigration can be traced back to the early 19th century; however, it increased geometrically after the 1970s. The Latino foreign-born population increased four times between 1970 and 2000, currently accounting for 46% of the overall Latino population in the U.S. (Ramirez, 2004). Nevertheless, the immigration flows' timing differs depending on the country of origin (Randall 1999; Ramirez 2004).

For instance, the largest Cuban immigration flow happened during the 60s, bringing to this country almost 40% of today's foreign-born Cubans. Central American immigration outnumbers any other Latino immigration flow during the 80s when almost 85% of Central American foreign-born entered the U.S. During the 90s, almost half of all foreign-born Mexicans and South Americans and 43% of foreign-born Puerto Ricans arrived into this country (Ramirez 2004).

Historical world events and the U.S immigration policies are important aspects for understanding Hispanic immigration flows (Baker 2002; Martin and Midgley 2003;

MacDonald 2004). As we will see in following sections, the relationship between the U.S and Latino countries began when most of these countries were Spanish colonies. Either the U.S conquered part of the Spanish territories or it was involved in their independence process. World War II, the Cold War, and the Great Depression are also important events/periods for understanding Latino immigration. In general, the U.S is usually less attractive to immigrants during times of war or internal economic recession, resulting in decreased immigrant flows during these periods. However, during World War II in particular, an increasing demand for labor was satisfied with Latino immigrants. Mexican and Puerto Rican immigrants were cheap labor in the Southwest and in the Northeast (Grosfoguel 1999).

Immigration policies are one way that receiving countries control and regulate the number and characteristics of immigrants coming to the countries. In most cases, immigration policies respond to world events and internal demands. As we will see later, although immigration policies are developed to fulfill particular goals, these policies might have unintended effects on Latino immigration flows.

Two main policies had important consequences for the overall Latino immigration: the National Origins Act of 1924 and the Immigration Act of 1965. The 1924 Act's main motive was to restrict immigration from Asia, Southern, and Eastern Europe by establishing overall maximum number of immigrants and yearly immigrant quotas by country of origin (Martin and Midgley 2003). These restrictions, however, did not apply to the Western Hemisphere. Thus, the U.S territory was kept open for Mexican and Caribbean immigrants, and flows from these regions began to increase (Baker 2002).

The Immigration Act of 1965 was a major reform aimed at curtailing growing Asian and Latino immigration flows (MacDonald 2004). Instead of limiting immigrant number by setting maximum quotas per country of origin, the legislation gave priority to individuals with particular skills and to those with relatives in the U.S (Martin and Midgley 2003). Therefore, the new policy simultaneously allowed a significant group of low-skilled and high-skilled immigrants into the U.S. The family reunification principle mainly benefited low-skilled immigrants, and the quality principle based on occupation mainly benefited high-skilled immigrants (Baker 2002).

After 1980, concrete reforms were implemented in response to specific problems such as illegal immigration. As a way of reducing the increasing number of illegal immigrants, the government enacted the Immigration Reform and Control Act (IRCA) in 1986, and the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) in 1996. The Immigration Reform and Control Act allowed about 2.7 millions illegal individuals to obtain legal status, and employers were legally empowered to verify work authorizations. Contrary to what was expected, this measure did not restrict illegal immigration, instead, it reinforced illegal flows of Mexican immigrants either because the naturalization of current illegal immigrants attracted more immigration or because the governmental institutions were not prepared to effectively implement the verification of work permit process (Martin and Midgley 2003). In contrast, IIRIRA increased the number of border patrols, developed a verification program for work authorizations, and increased the minimum income required for immigrant sponsor.

These policies and acts had important consequences on immigration from Latin American countries in terms of the timing of immigration, the socioeconomic resources

that immigrants bring and find in the U.S, and the general immigration experience. Particular programs such as *Bracero* or *NAFTA*, and events such as *Balsero boat floa*t and the *Cuban Mariels* will be discussed later.

Another important aspect of Latinos' immigration processes that could impact educational outcomes is immigration selectivity. Immigration selectivity refers to the determinants of immigration. Individuals in a given sending country experience different likelihood of immigration based on the their characteristic, differences in opportunities between the receiving and sending country, costs of migration costs, and opportunities to immigrate (Borjas 1987).

The selective nature of the immigrant group might have important consequences for their immigration experiences and adaptation processes because immigrants may vary in their motivation for immigrate, in their desires for assimilation, in the educational aspirations for their children, among other characteristics. Immigration selectivity might also be related to long term differences across ethnic/racial groups (Borjas 1987) which can be manifested in economic or educational differences of those generations born in the receiving country.

Thus, Latino groups' differences in immigration history and selectivity could have important consequences for immigrants' experiences in the new country. For instance, immigrants' "context of reception" affects generational differences in educational outcomes within Latino subgroups. The remaining sections of this chapter analyze immigration experiences of Latino subgroups.

Immigration from Mexico

Immigration from Mexico is the most predominant and oldest (Baker 2002). The relationship between Mexico and the U.S has its historical roots in the mid 1800s when the U.S conquered and annexed Mexico, at which time the U.S occupied the geographical spaces of Texas, Arizona, New Mexico, California, and Colorado, resulting in 75,000 Mexicans becoming U.S. citizens (Kloosterman 2003). Nevertheless, the new U.S citizens were considered inferior, their land privileges were taken away, and they were incorporated as low-level workers in agriculture and mining sectors (Baker 2002).

The more recent immigration from Mexico began in the 1900s, after the U.S constructed railroads between Mexican remote areas and the U.S territory, as part of labor-migration for agricultural, mining, and railroad sectors (Durand, Massey et al. 2001). It continued during the 1910s, when Mexicans escaped the Mexican revolution, and during the 1920s when they came in search of economic opportunities in the U.S industrial sector (Baker 2002).

After the 1920s, Mexican immigration increased significantly because of the U.S immigration policies and trade agreements between Mexico and the U.S. Particularly important for the Mexican immigration during this period was the National Origins Act of 1924. This regulation restricted the entry of Asian, Eastern and Southern European immigrants by establishing an annual quota per country of origin. This policy did not apply to Mexico resulting in unrestricted immigration from this country, with the intention of satisfying U.S labor demands with Mexican workers (Durand, Massey et al. 2001).

Two programs were particularly influential for the immigration link between the U.S and Mexico: *Bracero* and *NAFTA (*North American Free Trade Agreement). The *Bracero* program was implemented between 1940 and 1964. A bi-national agreement aimed at alleviating the shortage of farm workers during World War II that allowed Mexicans to legally work in the U.S agricultural sector. Originally conceptualized to bring workers for a short term, it instead originated a flow of information about job opportunities and benefits, which in turn aided legal and illegal migration (Alba and Nee 2003). Consequently more than 4 million Mexicans entered the U.S during this period (Durand, Massey et al. 2001).

In 1994, NAFTA was implemented to facilitate the movements of goods, money, and services, in order to increase investment opportunities and establish a system of cooperation and mutual support between the U.S, Canada, and Mexico (Burfisher, Robinson et al. 2001). The main objective of this agreement, therefore, was to accelerate economic development and job growth in all three countries (Martin and Midgley 2003).

From the beginning of the 20th century to the 1980s, the nature of Mexican immigration consisted mainly of seasonal and circular working-class males from the agricultural sector (Zuñiga, Hernandez-Leon et al. 2000), and unskilled and technical manual laborers (Durand, Massey et al. 2001) who were a main source of constant legal and illegal immigration (Rumbaut 1997). However, although Mexicans only had access to low status and little mobility opportunities, they were actually able to achieve some economic security (Parrillo 2002).

In the late 80s, because of the 1986 Immigration Reform and Control Act, a new type of Mexican immigrants arrived to the U.S. These new immigrants were family

members of earlier Mexican immigrants already residing in the country, nuclear and/or extended families. They came with different social and linguistic characteristics, were willing to permanently reside in the U.S, and developed new economic private enterprises (Zuñiga, Hernandez-Leon et al. 2000; Alba and Nee 2003). However, the IRCA-type immigration is still outnumbered by their earlier counterparts, and it seems likely that this situation will continue over time.

Since the beginning of the 20th century, the working class low skilled male immigration has increased steadily, currently accounting for three fourth of total Mexican immigrants (Durand, Massey et al. 2001). At the same time, the socioeconomic characteristics of Mexican immigration have remained static during the past 30 years (Alba and Nee 2003).

Based on the consolidated economic and historical relationship between the U.S and Mexico, it is estimated that the migration link between the two countries will continue at the same pace, if not increasing over time (Massey 1993; Bilsborrow and Zlotnik 1994). The "Migration Systems" theory states that migration processes create a unified and mutually influential space between place of origin and destination, where migration is only one of the links between them (Bilsborrow and Zlotnik 1994). As stated earlier, the U.S and Mexico are part of a long-term system of economic, commercial, and labor relations that are reflected in economic influxes to Mexico (Durand, Massey et al. 2001), such as the economical support granted by President Clinton during the Mexican recession in 1995 (Martin and Midgley 2003), and work-enhancing programs (i.e. *Bracero*, NAFTA, and USA textile industry in Mexico), among others.

The migration link between Mexico and the U.S is also reinforced by Mexico's poor economic conditions, the accumulation of immigration experiences, and the consolidation of Mexican networks in the U.S (Zuñiga, Hernandez-Leon et al. 2000). Thus, the migration between Mexico and the U.S could be seen as a self-reinforcing process of exchange at the community and individual levels (Massey 1993). Indeed, numbers indicate that half of Mexicans living in Mexico in 1980 had a relative in the U.S while a third of the population at one point lived in the U.S (Rumbaut 1997).

Mexican immigrants' "context of reception" in the U.S does not open significant opportunities for upward mobility. Mexicans experience discrimination from the U.S government and native citizens, and they face economic challenges because of changes in the labor market and lack of resources in their communities. Portes and Zhou (2001) consider that U.S government responses to Mexican immigration are hostile because Mexican immigrants are perceived as potential illegal immigrants. Native U.S citizens also treat them with disrespect and disapproval because they are perceived as unfair labor competitors, and willing to take any job despite its low-quality and low-paid labor conditions (Thornton and Mizuno 1999). Further, they are exploited through employment with inhumane conditions (Baker 2002).

These disadvantages are even greater when Mexican immigrants settle in communities where they cannot find a social or familial support network (Baker 2002), or in ethnic enclaves with little economic resources and few job opportunities (Logan, Zhang et al. 2002). They seem to benefit from close and supportive social networks that facilitate upward mobility possibilities.

Changes in the U.S. economy reduce job opportunities, particularly for immigrant Mexicans (Gans 1992; Portes and Zhou 1993; Zhou 1997; Zhou 1997). The U.S economy has been changing during the past twenty years mainly in three ways. First, it experienced increases in demand for service-oriented jobs and declines of manual labor jobs because of greater outsourcing or tendencies toward technology or mechanization (Gans 1992). Second, it is characterized by decreases in upward mobility channels because of the few middle level occupations and is therefore defined by Portes and Zhou (1993), and Zhou (1997) as an "hour glass." Third, the U.S economy is growing at a slower pace, especially in urban areas and secondary sectors, creating only low-paid, unstable, and marginal job opportunities (Gans 1992). Thus, in this economic context, higher level of educational attainment is a fundamental precondition for accessing better economic opportunities. Sadly, Mexicans mainly have low levels of education and cannot positively face these challenges (Lopez and Stanton-Salazar 2001).

Immigration from Puerto Rico

Puerto Rico became a U.S colony as one consequence of the Spanish-American war of 1898 (Nieto 2000). Since the beginning of 1900s, Puerto Rico is an important strategic place for the U.S, as a commercial route to South America and a military location to protect the U.S from European invasions (Grosfoguel 1999). Since then, the relationship between Puerto Rico and the U.S has been tense because of the lack of economic opportunities, political control, and judicial autonomy in the island (Pérez-González 2000). Although Puerto Ricans are U.S citizens, they are generally studied and

are considered part of the U.S immigrant population because they need to relocate to the mainland when leaving the island (Grosfoguel 1999).

Perez and Gonzalez (2000) divided Puerto Rican immigration to the U.S in three stages: the pioneer migration (1900-1945), the great migration (1946-1964), and the revolving door migration (1965-present). Mainly educated, skilled and urban workers constituted the pioneer immigration. Individuals immigrating at this time were more likely to be White males than Blacks and females respectively. During this period, Puerto Ricans were not yet recognized as U.S citizens upon arriving in the mainland. They sought extensive opportunities for economic development, social interaction support, and their cultural preservation, and developed ethnic communities to achieve these goals.

The great migration (1946-1964) was impressive in terms of the number of immigrants. Indeed, the U.S government supported this wave of Puerto Rican immigration to counteract the perceptions of extreme overpopulation and high levels of unemployment on the island (Nieto 2000). At the same time, the island represented a symbol of the benefits of capitalism, therefore low-skilled workers and unemployed individuals were sent to the mainland in order to mask information contradicting the perceived benefits of this political system (Grosfoguel 1999).

Puerto Ricans migrating during this period were the first to arrive to the mainland as U.S citizens. They were more likely to come from rural areas, to be Black, younger, less educated, low-skilled, and agricultural workers than those of the pioneer stage (1900-1945). Because of their new citizenship status, they were legal cheap labor for U.S

business. Although better paid than in the island, they held jobs that did not produce upward mobility (Baker 2002).

The last stage of Puerto Rican immigration began in 1965. The "revolving door migration" was mainly characterized by circular migration, with frequent back and forth movements between the island and the mainland, as Puerto Ricans owned homes and established social networks in both places (Lorenzo-Hernandez 1999). This type of immigration was a creative solution to handle economic hardships and to improve their economic conditions by having access to opportunities in two places (Nieto 2000; Oropesa and Landale 2000). Unfortunately, circular migration patterns have important consequences for Puerto Rican children's education. In New York, for instance, 30% of Puerto Ricans experience between one to four changes of school between 7th and 9th grades; changes that would likely interfere with students' learning processes (Nieto 2000).

During this immigration period also, particularly after the 80s, Puerto Rican immigrants became representative of various social classes (Grosfoguel 1999). Better-educated Puerto Ricans were more likely to go back to the island because of availability of better job opportunities. In contrast, low skilled Puerto Ricans found better job opportunities in the mainland, becoming less likely to go back to the island (Baker 2002).

Puerto Ricans' "context of reception" in the U.S does not reinforce the possibilities of upward mobility. In the mainland, they are relegated to the underclass culture, experiencing downward assimilation and permanent poverty (Pérez-González 2000). They mainly take jobs in the lowest levels of the industrial sector; do not have access to well-paid jobs with possibilities of professional upward mobility. After the 70s,

they experienced serious problems of unemployment in the mainland and lost important job opportunities because of the "deindustrialization" of the Northeast fabrics industry, and because new immigrants were willing to assume their jobs with lower pay and benefits (Baker 2002).

In contrast to the experience of the late 1930s, these recent immigrants were not able to develop entrepreneurial businesses or ethnic enclaves in the mainland, because of their lack of human and economic capital (Baker 2002). In addition, Puerto Ricans had less access to ethnic markets as their communities disintegrated after the 1970s.

Further compounding the forgoing problems is the fact that Puerto Ricans experience significant flows of discrimination and exploitation in the U.S because they are generally not recognized as citizens with similar rights and responsibilities. Their welfare dependency is a topic that generates frustration among the native Americans, who perceive and stereotype them as lazy individuals, preferring to receive welfare instead of working (Pérez-González 2000). Discrimination against them is also observed in schools where they are denied access to the best public schools (Grosfoguel 1999) and are more likely to be enrolled in vocational programs than any other U.S citizens (Pérez-González 2000).

Black Puerto Ricans experience additional situations of discrimination than non-Black Puerto Ricans. In the mainland, although Whites might consider Black Puerto Ricans as non-Whites, the African American community defines them as non-Blacks (Pérez-González 2000). This creates even greater challenges, making their integration into the economic market more complicated.

Immigration from Cuba

The relationship between Cuba and the U.S has its origins in the 1820s when Cuba was still a Spanish colony. In 1902, the U.S supported and granted Cuba's independence. Since the beginning of 1990, Cuban immigration to the U.S was mostly related to political instability or persecution rather than economic hardships (Baker 2002). Deported Cubans sought asylum in the U.S after revolting against Machado in 1930 and against Batista in the late 1950 (Baker 2002).

The largest Cuban immigration began in 1959 after Castro defeated Batista. From 1959 to 1962, it was estimated that at some points in time, 3,000 Cuban arrived each week (Alba and Nee 2003). During the 60s and 70s, Cuban immigration increased significantly, witnessing almost half a million of Cuban immigrants (Suárez-Orozco 1998; Kloosterman 2003). These immigrants were mainly highly educated, and representative of the upper classes; they were mostly professionals and businessmen willing to settle their businesses in the U.S (Grosfoguel 1999; Baker 2002). In addition, they were more likely to be light-skinned and with European attributes, which imply that their upward mobility possibilities were at least somewhat high (Alba and Nee 2003).

The U.S government particularly supported Cuban immigration through laws such as the Cuban Adjustment act of 1966. This act granted Cuban immigrants refugee status and political asylum without the required paperwork review. The U.S government also gave Cubans access to resources that no other group had; in terms of economic benefits, settlement arrangements, job training, social welfare, among others (Suárez-Orozco 1989; Suárez-Orozco 1998; Portes and Rumbaut 2001). The U.S government considered that

by providing support to Cuban immigrants, it was sending ideological messages to those Cubans remaining in the island about the wonderful advantages of coming to the U.S (Grosfoguel 1999).

During the 80s and 90s, Cuban immigration experienced a significant change in its characteristics. The main reason for Cuban immigration during these two decades was impoverishing economic conditions in Cuba. Cuban immigrants from these migratory flows were more likely to be Black and from less advantageous backgrounds. They were less educated and unskilled workers looking for economic prosperity in the mainland (Grosfoguel 1999).

Two particularly important events defined the new course of Cuban immigration during this time. During 1980, 125,000 Cuban immigrants, known as the *Marielitos,* arrived by boat to Florida (Copeland 1993) aiming to escape from their current economic situation. They were received with uncertainty by the U.S government because the U.S was not ready to relocate that many numbers of *Marielitos* or to support their economic expectations. The *Marielitos* were more likely to be Black, less educated, and mostly unskilled workers (Grosfoguel 1999). According to Baker (2002) a significant number of the *Marielitos* were political prisoners or mental patients, but Alba and Nee (2003) stated that they were mainly young working class individuals hoping to attain high economic status in the U.S. The *Mariel* boatlift was the undisputed event that ended the massive legal immigration flow of Cubans in 1980 (Baker 2002).

From 1994-1995, the Cuban *Balsero* crisis occurred (Nackerud, Springer et al. 1999). In 1994, Cubans rioted against inhuman economic conditions on the island. Castro, blaming the U.S for the impoverish conditions in Cuba and for the support of

illegal migration, retaliated by deciding that his government would not stop illegal attempts of immigration. As a consequence, thousands of illegal Cuban immigrants attempted to cross the ocean to U.S coasts. Some of the *Balseros* were received in the mainland; others were repatriated and detained in Guantanamo Bay (Copeland 1993). In 1995, the Clinton administration ended the open door policy toward Cuban immigration, significantly restricting the immigration quotes and eliminating economic and governmental support for Cuban immigrants (Grosfoguel 1999; Nackerud, Springer et al. 1999). As a way of resolving the current crisis, the U.S granted political asylum to those Balseros detained in Guantanamo the previous year, and handed over the process of migration to the Cuban government.

Based on the historical link between Cuban immigration and the U.S, Cuban immigrants experience two clearly distinct types of context of reception. During the 1960 and 1970, they were able to achieve upward mobility relatively quickly (McHugh, Miyares et al. 1997; Grosfoguel 1999; Portes and Rumbaut 2001; Baker 2002). Moreover, they came to the U.S with high levels of social and economic capital given that they were mainly professionals and members of the Batista regime (Portes and Rumbaut 2001).

During the 1960 and 1970, the U.S government also facilitated Cubans' upward mobility by granting them refugee status and giving them access to different types of resources. U.S policies and programs encouraged Cuban immigration by supporting entrepreneurial ethnic businesses and access to education. Portes and Rumbaut (2001) pointed out that the governmental support received by Cuban immigrants was extremely useful in facilitating quick upward mobility among highly educated Cubans, and in

improving their economic situations because of the monetary support and the job opportunities they received.

Access to economically strong and protective ethnic enclaves in Miami was another important factor that facilitated Cubans incorporation to the U.S. These enclaves were rapidly developed soon after the first waves of immigration with different types of businesses, jobs, and economic opportunities. Strong ethnic communities are also important when norms of responsibility and school success need to be reinforced (Zhou 1997; Portes and Rumbaut 2001).

The 80s and 90s Cubans' "context of reception" was somewhat different. The U.S government and native citizens did not positively receive either the *Marielitos* or the *Balseros*. Although these groups did not receive refugee status, benefits, or economic support that previous immigrants did (Copeland 1993), native-born U.S individuals did not show positive attitudes toward them. They were blamed for the increase in crime rates in Florida in the 90s and for taking advantage of the U.S (Copeland 1993). However, the integration of the *Marielitos* and *Balseros* was relatively easy because of their solid community "context of reception". Residing in their protected enclave in Miami and the lack of internal discrimination was important for their incorporation in the U.S (Zhou 1997; Portes and Rumbaut 2001). These immigrants also received from their ethnic communities, possibilities of learning the native culture and language.

Immigration from Central America and Dominican Republic

During the 1960s and 1970s, flows of Central American and Dominican immigrants to the U.S, almost nonexistent before, increased. On the one hand, immigration from this region was a consequence of economic and political instabilities in countries such as Nicaragua, El Salvador, and Guatemala (Wallace 1986). On the other, Central American immigration was highly linked to the U.S economic and military interventions in these countries. The U.S was extremely committed to installing political regimes to avoid the development of a "new Cuba" near U.S borders (MacDonald 2004).

In the 80s, Central American countries such as Nicaragua, El Salvador, and Guatemala continued to face violent and traumatic experiences due to civil wars, disappearances, terrorism, torture, and killing (Suárez-Orozco 1989). Life in these countries was characterized by political terror and uncertainty. A significant number of Central Americans requested political asylum in the U.S either because of the violence and oppression, or because they were escaping the possibility of being drafted to fight in internal wars (Suárez-Orozco 1989).

The U.S government did not grant blanket refugee status, instead, its political response varied depending on the specific Central American country. Dominicans, for instance, were beneficiaries of an agreement where surplus labor and political rebels could legally access the U.S (MacDonald 2004). In contrast, Salvadorians, Nicaraguans, and Guatemalans did not receive such support. The most common response for the later group was to deny them refugee status (Rumbaut 1997). Less that 5% of those requesting political asylum were successful. As a consequence, individuals from these countries

became illegal immigrants (Wallace 1986) and in 2000, Central Americans in the U.S had the highest proportion of non-citizenship (Ramirez 2004).

Central American immigration is formed by a complex group of individuals. A small contingency of Central Americans came with high human capital and are professionals with high levels of education. Particularly, selective immigration came from Dominican Republic. Dominican immigrants tend to be young, from urban areas and have better educational credentials than those who stay in their country of origin. At the same time, illegal Dominicans are likely to arrive legally to the U.S with a tourist visa; implying that before coming to the U.S they had to fulfill high economic requirements in order to obtain this visa (Alba and Nee 2003).

In contrast, the biggest contingency of Central American immigrants is low-skilled with less education than the average immigrant. Salvadorians, for example, are more likely to come with low levels of education. Most of these low skilled immigrants are also illegal (Portes and Rumbaut 2001).

Unfortunately, their illegal immigrant status has important negative consequences for upward mobility possibilities. In spite of their high levels of human capital, Salvadorians frequently accessed only low-paid unskilled jobs because of their illegal immigrant status (Portes and Rumbaut 2001). Not having access to economic resources limited their opportunity of settling in good neighborhoods with decent educational systems (Suárez-Orozco 1989).

Central American and Mexican immigrants share important similarities in the characteristics that they bring to the country, as well as in their context of reception. Central American immigrants also have low economic status and educational levels,

being as likely as Mexican immigrants to obtain low skilled jobs (Hirschman 2001). In the same sense, Central Americans have little upward mobility possibilities because of their low levels of human capital, discrimination, few labor market opportunities, and U.S government and local communities' prejudices.

Immigration from South America

South American immigration is relatively new; therefore, it is difficult to find studies that analyze migration links between South America and the U.S. Even more difficult to find is empirical research about South American assimilation. The history of South American immigration in the U.S will therefore be written in the future.

The most important piece of information available is that South American immigrants are more likely to come with high levels of human and economical capital than any other Latino immigrant group, particularly those immigrating from Venezuela, Argentina, Bolivia, and Chile (Rumbaut 1995; Lowell and Suro 2002; Larsen 2004). The geographical distance between South American countries and the U.S supports the hypothesis that South America immigration tends to be highly selective and highly skilled. In addition, they are more likely to be light-skinned and have European complexity than other Latino immigrants (Waters 1999). These two characteristics might be very important for their adaptation to the U.S society.

Summary and Conclusions

The Latino population is rapidly growing and clearly changing the U.S population. In 2000, Latinos became the most predominant minority in the U.S. At the same time, they are considered a high-risk group. In comparison to Whites and Blacks, Hispanics are more likely to live in central cities in metropolitan areas, have lower levels of economic status and education, are relatively young, and speak another language at home other than English.

Latinos from distinct countries of origin come with different characteristics, immigration experiences, English ability, educational and poverty levels, among other things. Hispanics are systematically different depending on their country of origin. Also, Latinos from different countries of origin experience different contexts of reception, adaptation and acculturation processes, settlement patterns, and upward mobility opportunities in the receiving country (Portes and Zhou 1993; Rumbaut 1995; Rumbaut 1997; Zhou 1997; Zhou 1997; U.S.-Census-Bureau 2000; Hirschman 2001; Portes and Rumbaut 2001; Zhou 2001).

Hispanic subgroups' immigration experiences are related to the availability of resources, and risk or resilience factors. Their access to resources is related to what each immigrant group brings to the U.S and to their "context of reception". It could be expected that immigrants bringing more resources would be able to show better educational outcomes than those bringing less resources. Each generational status represents a specific arrival cohort who comes with different levels of resources.

Moreover, immigration experiences that are related to membership in a particular generation might have important implications for students' SES backgrounds.

Consequently, Latinos' well being and integration into the U.S society are key issues of analysis. Also, Hispanics' diversity and immigration experiences are key issues to understand Latinos' outcomes in the U.S. These dimensions are particularly important for understanding Hispanics' educational outcomes.

More research is needed to disentangle the relationship between Hispanics' immigration experiences and their educational outcomes. Identifying the nature of the relationship between immigration and education, and the mechanisms through which immigration affects educational outcomes are key issue of analyzes.

CHAPTER 3

LITERATURE REVIEW AND THEORETICAL CONSIDERATIONS

In this chapter, I integrate different theoretical perspectives in order to understand Hispanic students' educational outcomes. First, I discuss immigrant assimilation theories and cultural arguments. These theories help us placing the discussion about Hispanic students' educational outcomes within a broader frame of racial/ethnic and immigration inequality issues. They are also relevant for predicting math outcome differences among Hispanic subgroups and for explaining why differences among these groups exist.

Immigrant assimilation theories emphasize the relevance of immigration experiences, length of residence in the host country, and settlement processes, to explain immigrants' adaptation processes into the U.S society (Portes and Zhou 1993; Zhou 1997; Portes and Rumbaut 2001; Alba and Nee 2003). Immigrant assimilation theories also reinforce the importance of further disaggregating Latinos by generational status.

In contrast, cultural explanations relate minority students' school success or failure to antagonisms between minority and majority groups, differences in cultural values and attitudes, perception of unequal power structure and reward systems, and ethnic/ racial groups' position within the U.S social structure and power relationships (Ogbu 1987; Ogbu 1991; Ogbu and Simmons 1998).

Second, I review recent empirical findings about English ability and SES, which are the most predominant variables related to Hispanic students low school performance

(Carliner 1995; Winsler, Diaz et al. 1999; Olatokunbo, Slavin et al. 2001; Padilla and Gonzalez 2001; Gándara, Rumberger et al. 2003). Particular attention is paid to English ability and SES effects on Hispanic students' educational outcomes and the mechanisms through which these variables affect their performance.

Further, because neither of the previous theories fully explains existing evidence of Hispanic students' educational disadvantages, I analyze school effect literature. School effects literature relates arguments of educational inequality or school success to the school context. Thus, educational performance is related to differences in access resources and characteristics between and within schools (e.g. school segregation, tracking, and amount of instruction). This literature is useful for elaborating alternative explanations about Hispanic students' educational outcomes taking into account differences in educational performance by time periods (e.g. kindergarten, first grade, and from first to third grade).

Generational Status and Immigrant Assimilation Theories

Immigrant assimilation theories predict differences in outcomes by race/ethnicity and generational status. These theories are widely applied to explain Hispanic students' educational experiences, given that 68% of Hispanics belong to the first or second generation (U.S.-Census-Bureau 2000). These theories argue that either earlier or later generations experience improvement in outcomes depending on their interactions with different groups within the U.S. society. According to some assimilation theories,

outcomes improvements are related to immigrants' characteristics and support at the government and community levels.

Three main groups of theories have been developed to explain differences in assimilation among immigrants of distinct generational status: i) Classic Theories of Assimilation, ii) Segmented Assimilation, and iii) New Assimilation Theory. These theories, although develop to explain broader patterns of assimilation, are used to explain differences in students' educational experiences. In addition to analyzing these theories, this section also reviews the "Immigrants Optimism" hypothesis, which has gained some popularity in explaining second generation students' educational advantages.

Classic Theories of Assimilation

Based on the assimilation of European immigrants at the beginning of the century, and on the idealization of the U.S. society as a "Melting Pot," Gordon (1965) and Park (1950) developed "Classic theories of assimilation." These authors argued that immigrants of different sending countries inevitably became assimilated into the U.S society, and therefore, became more similar to U.S mainstream individuals over time. Assimilation was defined as the acquisition of the receiving country's cultural values and historical memory. How fast immigrants acquire the receiving country's cultural values and historical memory define the pace of assimilation (Portes and Rumbaut 2001).

Structural assimilation, as defined by Gordon, results from immigrants' incorporation into social institutions and social groups with individuals of the receiving society (Park 1950; Gordon 1965). The degree of structural assimilation is based on the

receiving society and is related to changes in cultural patterns and a new sense of being among immigrants. Also, it relates to absences of prejudice and discrimination from the receiving society's individuals and institutions (Park 1950; Gordon 1965).

As Alba and Nee (2003) pointed out, the original formulation of assimilation was equated with social and economic mobility. Socioeconomic mobility is reached when immigrants acquire, at least, middle class status or economic parity with the mainstream, or when immigrants access equal opportunities regardless of their ethnic characteristics. Socioeconomic mobility was highly interrelated to residential mobility. In order to have access to socioeconomic mobility, immigrants move to suburban areas leaving their ethnic enclaves in urban cities. They experience the benefits of the U.S society, and consequently, experience improvement of outcomes based on generational succession, length of residence in the country, and their integration with local social institutions (Park 1950; Gordon 1965).

These theories stated that although all immigrant groups experience different paces of assimilation, it takes on average of three generations for immigrant groups to lose their language and culture, and therefore, become economically assimilated (Grosfoguel 1999). As a consequence, "Classic theories of assimilation" predict that either early immigrants or those from higher generations have better educational outcomes than recent immigrants. These theories also predict similar patterns of assimilation regardless of immigrants' country of origins and social class.

The Segmented Assimilation Theory

Assimilation outcomes of immigrants coming into the U.S after the 1960s challenged the applicability of "Classic theories of assimilation." Empirical data did not totally support the assumed improvement outcome patterns by generational status among all immigrant groups. As a response, Portes & Zhou (1993) proposed the Segmented Assimilation Theory for explaining the assimilation process of the second generation acknowledging that the U.S is not a monolithic society and the diversity across immigrant groups.

Segmented Assimilation theory equates assimilation to social mobility or having at least average socioeconomic status and similar educational outcomes as the White middle class (Alba and Nee 2003). Portes and Rumbaut (2001) postulated that assimilation is not a homogeneous process; immigrants from different origins assimilate into distinct sectors of the U.S. society. Consequently, immigrants could take three paths in becoming part of the U.S. society. One, they could become assimilated to the White middle class, and therefore, share their cultural customs and economic and social advantages. Two, they could be part of the underclass culture and experience downward assimilation and permanent poverty. Third, immigrants and their descendents could achieve similar economic status as the White middle class but with the preservation of their own culture (Gans 1992; Portes and Zhou 1993; Zhou 1997; Portes and Rumbaut 2001).

Segmented Assimilation theory considered that assimilation depended on the complex interaction of several factors, whose levels of relevance are contextual and time

specific. Assimilation depended on first generation immigration experiences; first and second generations' acculturation; the social and economic barriers faced in the receiving society; and the resources that immigrants access based on their family and community support (McHugh, Miyares et al. 1997; Portes and Rumbaut 2001).

Indeed, assimilation paths partly depended on SES and human capital that immigrants bring to the host society – including their educational levels, work experience, and English knowledge. Educated immigrants are more likely to be successful in the economic market and to access upward mobility channels. However, high human capital is not a sufficient condition for assimilation. Immigrants' adaptation is highly influenced by their participation in the receiving society. Specifically, it is related to what Portes and Rumbaut (2001) deemed as their *modes of incorporation and the context of reception* that provide economic and informational resources at the macro level through governmental support and at the micro level through their ethnic communities (Zhou 2001). Thus, this theory emphasized that modes of incorporation and the context of reception could mediate the relationship between upward mobility and immigrants' educational levels and income (Portes and Rumbaut 2001).

Immigrants experience favorable or negative modes of incorporation depending on the complex interactions between resources availability and vulnerabilities to downward assimilation. Their access to resources varies by country of origin and timing of immigration, and it depends on government support programs and policies, ethnic community resources, and the attitude of the overall receiving society. For instance, refugee status facilitates access to resources through economic, educational and information support given by the government. Also, having access to a solid community,

or even better, to an ethnic enclave could mediate the adaptation process into a new society, and at the same time, could provide job opportunities or connections outside the enclave in finding employment opportunities.

Unfortunately, the positive effects of access to available resources could be countered by the presence of vulnerability to downward mobility, highly related to factors such as labor market demands, location of residence, and immigrants' skin color. An immigrant's skin color is a revealed marker of their race, which is a cause of discrimination and could limit their access to work opportunities and social acceptance (Portes and Rumbaut 2001). In addition, current economic tendencies are generating new challenges for immigrants' adaptation. The U.S economy is not only changing, it is also growing at a slower pace, especially in the secondary sector in urban areas. Physical labor demands are decreasing as well as middle level occupations, causing upward mobility channels to be scarce. Finally, urban central cities where immigrants are more likely to settle are becoming poorer. The racial/ethnic groups that tend to be concentrated in these areas are commonly identified as the underclass group characterized by lower values and oppositional cultures (Gans 1992; Portes and Zhou 1993; Perlman and Waldinger 1997; Zhou 1997; Portes and Rumbaut 2001).

Moreover, parents and children's acculturation patterns can impact positively or negatively the assimilation of second generation children, and therefore, their educational outcomes. Depending on the process of acculturation – time and pace, and the maintenance of parents' authority, three main outcomes of acculturation can be observed. *Selective and consonant acculturations*, when both parents and children acculturate at the same pace and parent's authority is respected, could be related to better educational

outcomes. In contrast, *dissonance acculturation*, when children lose parents' cultures and values and parents lose their authority, could be related to second generation immigrants' risk of educational failure.

Even though the Segmented Assimilation theory focuses on second generation children's assimilation and their educational outcomes, this theory also predicts that distinct immigrant groups experience either improvement or decreasing educational outcomes by generational status. This theory assumed that immigrant groups that maintain their ethnic cultures, bring further economic resources, and have strong ethnic community ties in the receiving country are more likely to experience educational success. This theory also predicted that for some immigrant groups, more years of living in the U.S could be related to disadvantaged educational outcomes (Hirschman 2001).

The Segmented Assimilation theory brings important highlights to our understanding of immigrants' assimilation processes, by recognizing the variability of outcomes among immigrant groups. This theory also could be applied to different types of immigrants – including refugees – and incorporates the social context as a strong explanatory variable in understanding differences in assimilation experiences. Additionally, the Segmented Assimilation theory identifies important structural and cultural factors, and emphasizes the importance of community level support for explaining educational experiences.

New Assimilation Theory

Recent investigations by Alba and Nee (2003) have partially questioned the value of previous assimilation theories in understanding immigrants and their children's adaptation processes. Although these authors build their theoretical formulations on the Segmented Assimilation theory, they go beyond by redefining the concept of assimilation and specifying mechanisms through which assimilation occur. Alba and Nee argued that assimilation cannot be equated to Americanization. On the contrary, it is a bilateral process of mutual influence that involves changes in both the receiving and the immigrant groups. It also involves the attenuation of the original groups' differences that finally lead to the mutual recognition of these initially unconnected populations as members of the same group.

Based on this theory, assimilation is neither the only result of adaptation nor a homogenous process. Thus, immigrants could assimilate, becoming part of ethnic minorities; or show pluralistic patterns, keeping their own communities and cultures. Assimilation is one way of becoming part of the new society, and this varies across and within racial/ethnic groups. Also, this theory does not assume that assimilation is strictly related to social mobility per se. Some first generation immigrants, such as East Indians; Koreans; and Philippines; start their assimilation process at higher levels of the upward mobility ladder, reaching better economic prosperity than less advantaged White Americans groups. Other immigrants, such as Mexicans and Central Americans, do not experience the same upper mobility as their parents. Most likely, they remain close to their parents' economic position. Alba and Nee (2003) expanded even more on the

concept of assimilation, suggesting that it could be an incremental process that evolves for later generations or within generations that progresses overtime; suggesting that assimilation processes can be reflected in different paths.

In addition, Alba and Nee (2003) explained the possibility of different rates of assimilation through various forms of capital (i.e. human, financial, and social). Assimilation is affected by the financial, human and social capital that immigrants bring and also the way these capitals are allocated within the ethnic community and in the whole society. Additionally, how much leverage immigrants have to make decisions is highly related to their capital repertoire. For instance, Mexican and Central American labor immigrants lack the same amount of human and financial capital as professionals do. Thus, they have fewer opportunities to access jobs outside their ethnic community.

Supply of capital is also related to the causal mechanisms of assimilation at three different levels: at the individual level, the social network or the community, and the institutional context. At the individual level, assimilation occurs as a possible consequence from unintentional and conscious decisions. These authors consider that immigrants, as any human being, make decisions taking into account potential risks and benefits but with less information; and they are restricted by institutional contexts. For immigrants, institutional context's restrictions include federal and governmental regulations or job opportunities in the ethnic enclave and mainstream institutions.

However, assimilation is not only a consequence of rational and context-bound decisions; it is also affected by daily decisions that are not related to assimilation choices. Decisions that orient life success goal; such as, finding a new house in a safe neighborhood, accessing good education, and having high educational expectations, have

cumulative effects towards assimilation, impacting first generations' acculturation. Thus, the acquisition of mainstream cues that signal membership and familiarity with the new social setting and reduced social distances set important precedents for assimilation (Alba and Nee 2003).

At the social environment level, the authors emphasize the importance of network mechanisms to maintain norms for maximizing benefits at the group level. Thus, immigrants pursue group goals in a sustainable way through engaging in community actions based on collective rewards and punishment. Members of the network simultaneously and spontaneously reinforce and encourage collective behaviors for obtaining maximum benefits. At this level, although rational and bounded decisions occur at the individual level, a high important and deterministic aspect is the group's approval of particular behaviors. When discriminatory barriers exist, assimilation processes highly depend on collective strategies.

Mechanisms at the institutional context have a fundamental role for assimilation as the setting where rules and incentives for social relationships are defined. Different institutional incentives can generate different outcomes even with similar mechanisms at the individual and social levels. Individual actions cannot be understood if we do not consider the institutional framework, which in countries such as the United States, is mainly represented by the state. One of the most important mechanisms of the state regulations is related to the reinforcement of equal rights and therefore, the implementation of barriers to discrimination (i.e. equal employment opportunity laws, zero tolerance against discrimination) results in opportunities for success. The other context where macro level mechanisms are found is the labor market, through the

opening of new occupations and economic sectors that could be accessed by immigrant groups.

The new assimilation theory predicts the variability of assimilation based on the interaction between different levels of capital and individual, social, and institutional mechanisms. The variability in assimilation is observed between and within ethnic groups. This theory brings important insights in understanding the mechanisms through which assimilation is one possibility for immigrants' adaptation.

This theory does not apply to explain differences in assimilation by generational status. However, it has important implications in understanding the mechanisms through which immigrants from different countries of origin and their children assimilate.

"Immigrants Optimism" hypothesis

The Immigrants Optimism hypothesis states that parents' immigration status is more influential on educational outcomes than children's immigration status (Kao and Tienda 1995). Through high expectations and encouragement, immigrant parents reinforce educational success (Kao and Tienda 1995). As a consequence, second generation immigrants experience superior outcomes not only because of their positive home environments, but also because of their knowledge of English. This hypothesis predicts that second generation children have better educational outcomes than third and first generation students. Immigrant students gain from both strong parental support and the English ability required to succeed in schools.

Most assimilation theories point to the importance of studying different generational statuses of each immigrant group. All these theories support the importance of SES for understanding immigrants' adaptation and educational outcomes. However, as some empirical research has shown, SES and English ability may not entirely explain the White – Hispanic students' educational achievement gaps. Cultural arguments were developed to fill this explanatory gap. These theories also emphasize the relevance of language, as the main mechanism for cultural transmission, in explaining variability in educational outcomes among Hispanics.

Cultural Arguments

Most of the cultural arguments focus on how social forces and historical relations between minority and majority groups affect minority students' educational outcomes (see for example, (Ogbu 1987; Trueba 1988; Ogbu 1991; Valenzuela 1999) (Delgado-Gaitan and Trueba 1990; Rong and Grant 1992). In operational terms, this research explains Hispanic students' educational disadvantages through factors such as educational aspirations, students and their families' attitudes toward work and schooling, and behavioral differences between minority and mainstream students (Marks 2005). In this section, I analyze the two major theories developed from a cultural perspective to explain Hispanic under-achievement: i) cultural discontinuities and iii) cultural ecology.

Cultural Discontinuities

This theory explains low performance by changing the focus of attention from deficiencies to potential differences between minorities and institutions such as schools. Mismatches in communication patterns, language, and other cultural expressions are translated into cognitive and linguistic differences across ethnic groups generating misunderstanding in daily interactions (Suárez-Orozco 1998). Consequently, minorities' low school achievement is not related to individual or group deficiencies, but to school curricula designs that are not responsive to cultural and language differences (Delgado-Gaitan and Trueba 1990). Underachievement is also related to teachers' inability and intolerance to diversity, school inefficiencies, and the inability of state legislators and federal government to be responsive to individual needs and cultural differences (Suárez-Orozco 1998).

In addition, this theory explains Hispanic students' low performance based on the "language discontinuity" between Hispanic homes and U.S schools, that generate misunderstanding and inferior learning patterns (Suárez-Orozco 1998). From another perspective, the cultural discontinuity model also consider that Hispanic students might not be able to dominate White middle class symbols required for school success, because of the intrinsic differences between the Hispanic and White middle class culture (Suárez-Orozco 1998).

The cultural discontinuity theory has also been applied in explaining differences in educational performance among Hispanic students from different generations. Rong and Grant (1992) considered that language, culture, and interaction conflicts between U.S

schools and immigrant families negatively impact immigrant children's educational experiences. Moreover, this theory predicts that the length of residence in the U.S and acculturation to U.S schools could increase their educational performance.

Cultural Ecology

Ogbu and colleagues (1987, 1991 and 1998) developed the "cultural ecology" model for explaining educational failure and success for two types of minority groups: involuntary minorities and voluntary immigrants. Ogbu (1991) argue that involuntary immigrants are those incorporated as part of the U.S through slavery, conquest, or colonization. These groups are traditionally placed in low skilled jobs with almost nonexistent possibilities for upward mobility (Suárez-Orozco 1998). Voluntary immigrants, who decide to come to the U.S seeking greater economic opportunities or political freedom, are more likely to succeed in schools than involuntary minorities. Based on social and historical experiences in their host societies and on their own cultural standards, involuntary and voluntary immigrants develop different perceptions of opportunities, adaptive strategies and responses to the dominant group's treatment.

Involuntary immigrants, for instance, develop a negative dual frame of reference when their own situation is compared to experiences of the mainstream. To them, the dominant group has all the hegemony over policies and practices, and institutions are oppressive. Clearly, involuntary minorities view the dominant group and their institutions as oppressors. They perceive fewer possibilities of upward mobility and education is not considered a ladder towards upward mobility.

Based on these perceptions, involuntary minorities resist assimilation and consider that they do not obtain benefits from schools (Trumbull, Rothstein-Fisch C et al. 2001). They develop an oppositional culture to preserve their own cultural identities limiting their effort and involvement in school. Involuntary immigrant adolescents get involved in what Ogbu called "cultural inversion," where minorities consciously or unconsciously oppose discourses, cultural practices, and behaviors of the dominant group (Valenzuela 1999).

In contrast, voluntary immigrants optimize most opportunities that the receiving country gives them. Also, they have a positive frame of reference, comparing their current situation with their experiences "back home," perceive significant possibilities of upward mobility, and believe that their discrimination and poverty is temporal. As a consequence, voluntary minorities are more likely to give up part of their culture to become part of the new society, to ameliorate oppressive experiences, having a positive perspective, and high engagement and positive attitudes toward school. Schools for voluntary immigrants open important opportunities for upward mobility (Trumbull, Rothstein-Fisch C et al. 2001).

Following Ogbu's perspective, Hispanics such as Puerto Ricans and Mexicans, are involuntary minorities because their ancestors were incorporated to the U.S through colonization and conquest. Thus, these Hispanics students share involuntary minorities' perceptions and behaviors (Suárez-Orozco 1998; Nieto 2000). They exhibit negative attitudes towards school and are against high performance standards because they perceive those standards as expected behaviors of the dominant class. They also believe

that their educational achievement is not equally rewarded compared to the dominant population (Suárez-Orozco 1995; Suárez-Orozco 1998; Valenzuela 1999).

Consequently, some Puerto Ricans' educational underachievement is not related to their different language, culture, cognitive skills, or communication styles. Rather it is related to their history of conquest and exploitation since the U.S. annexed the island (Nieto 2000). Similar explanations are given for Mexican students' low educational achievement.

Both immigrant assimilation theories and cultural arguments mostly focused on macro level factors by analyzing how structural and cultural dimensions impact Hispanic children' educational outcomes. Structural explanations relate minorities' position within the social power hierarchy to their educational experiences. Cultural explanations link cultural values and attitudes to school success or failure assuming that a particular ethnic group's traits, which differ from the mainstream, are responsible for minority students' low educational performance (Kao and Thompson 2003). However, these theories fail to identify the specific mechanisms through which these macro level influences are translated into individual behaviors. In the next section I analyze two of the most important individual variables related to Hispanic students' educational performance.

The Role of English Ability and SES in Hispanic Students' Educational Outcomes

Discussions about Hispanics' educational disadvantages mainly focus on their language and socioeconomic characteristics. SES and English proficiency are among the most important predictors of Hispanic students' low educational achievement, as they are

more likely to be non-English speakers and to live in low SES families than any other racial/ethnic groups (Garcia 2000; Schmid 2001). Most of these past studies find SES's and English ability's effects using cross-sectional data, which are limited in explaining the process through which these variables impact students' educational outcomes. Using a longitudinal data, as I do in this study, can highlight when SES and English ability effects begin and how they evolve over time.

Hispanics' Poverty and SES Effects on Students Educational Achievement

Latino poverty is a serious problem. Latinos' family median income in 2000 was $33, 000, which represents only 69% of Whites' family median income (DeNavas-Walt, Proctor et al. 2004). On average, 22% of Latinos in the U.S. live below the poverty line, compared to only 8% of Non-Latino Whites (U.S.-Census-Bureau 2003). Unemployment rates for Latinos are on average 50% higher than those for the overall population. This situation shows a particularly alarming picture for Latinos, given that those who are working are over represented in low-paid and low-skilled jobs (Suárez-Orozco 1989).

Poverty levels are even more striking if we analyze first generation Latino immigrants and their children. Latino immigrants are more likely to be poor than immigrants from Asia, Europe or Africa. Approximately 20% of Latino immigrants live below the poverty line compared to 10% among European, and 13% for Asian and African immigrants (Tienda 2002). Approximately, 62% of Latino children live in low-income families (Douglas-Hall and Koball 2004). Also, 30% of Latino children live

below the poverty line rising to 34% for only foreign-born children compared to 8.28% and 30.71% for native White and Black children (Litcher, Qian et al. 2005).

Among all Latinos, Dominicans, Mexicans and Puerto Ricans experience the worst economic conditions. Approximately 28%, 25% and 24% of Dominicans, Puerto Ricans and Mexicans respectively, live below the poverty line (Ramirez, 2004). The percentage of Central Americans who live under the same conditions decreases to 20%. Poverty rates are clearly greater for children under 18 years old; approximately 32% of Mexican and 38% of Puerto Rican children live below the poverty threshold (U.S.-Census-Bureau 2003). In terms of family median income, Mexicans, Puerto Ricans and Central Americans have similar incomes; between $32,000 and $34,000 in 2000.

In contrast, Cubans and South Americans are better off compared to other Latinos. They have higher economic levels and are less likely to live below the poverty line than the Latino groups mentioned earlier. Only 15% of Cubans in the U.S. (U.S.-Census-Bureau 2003), and 15% of South Americans live under the poverty line (Larsen 2004). Individuals from both countries have similar median family incomes, around $42,500 (Ramirez 2004).

The impact of SES on students' educational outcomes has been recognized in the literature (Coleman, Hobson et al. 1966; Lee and Burkham 2002; Kao and Thompson 2003). Overall, students from low socioeconomic environments are more likely to obtain lower grades, less likely to be retained and to drop out from high school than those from economically privileged families (Entwisle and Alexander 1993; Garcia 2001). At the same time, children of parents with more education, higher income, and higher-status

jobs are more likely to have higher levels of education than the more disadvantaged children (Schmid 2001).

Students' family SES is often used to explain racial/ethnic group and generation differences in educational outcomes (Crosnoe 2005; Marks 2005). Some immigrant students' families have few economic resources, with parents having low levels of educational attainment, lower-status jobs, and low incomes. In contrast, it is expected that immigrants from higher socioeconomic backgrounds would have similar educational outcomes as non-immigrants from the same socioeconomic level (Marks 2005).

Research shows stronger effects of students' SES than of racie/ethnicicy on educational achievement. Differences in cognitive achievement are greater by SES than by race/ethnicity (Lee and Burkham 2002). Also, most of the race/ethnicity and family structure effects on educational achievement can be explained by students' economic disadvantages (Entwisle and Alexander 1993).

Several mechanisms have been defined to explain how SES advantages can translate to better educational outcomes. Family SES advantages are positively related to students' access to resources, social capital, cultural capital, and school quality which in turn positively impact students' educational achievement.

Students from high SES families have better educational outcomes because they have better access to resources. High SES families invest additional economic resources, and provide more assistance and time to their children's educational needs (Wojtkiewicz and Donato 1995; Portes and Rumbaut 2001). Having literacy materials at home, for instance, have significant effect on children learning outcomes (Guo and Mullan 2000).

Moreover, SES impacts students' educational outcomes through their social capital. Students obtain benefits and opportunities because of their membership in social structures. The family, as the primary social structure in which any individual is embedded, is a very important source of social capital. Coleman (1988) argued that no matter how much human capital parents have, if they don't share resources with their children, children do not receive any benefits from their parents' human capital. Parents transmit their socioeconomic advantages to their children through having positive home environments, cohesive, and stable homes.

Positive home environments encourage and support learning by reinforcing behaviors that lead to higher achievement (Hao and Bonstead-Bruns 1998; Driscoll 1999; Pong, Hao et al. forthcoming). Parental styles that are warm and supportive, but at the same time, define clear limits and supervise their children are related to positive adolescent cognitive and emotional outcomes (Driscoll 1999). Furthermore, parents that are more involved in their children's life by participating in activities together and establishing accessible channels of communication might also be related to positive educational outcomes. Thus, it is through childrearing practices, and supportive and strong interpersonal relationships at home that high-SES parents encourage positive behaviors and attitudes in their children and reinforce their children's formal learning experiences (Hao and Bonstead-Bruns 1998; Driscoll 1999; Pong, Hao et al. forthcoming).

In addition, Hao and Bostead-Buns (1998) considered that economic advantages are also translated to higher educational achievement by providing better educational opportunities and significant role models. Some high-SES families transmit positive

attitudes toward education (Schmid 2001) and are involved in educational activities that develop children's cognitive skills, such as reading out loud and conversational interactions (Gándara, Rumberger et al. 2003).

Another important mechanism through which SES advantages are translated into educational advantages is cultural capital (Katsillis and Rubinson 1990). Cultural capital, a theoretical concept developed by Bourdieu (1973; 1977; 1986) and DiMaggio (1982), was originally formulated to explain differences in educational achievement that could not be entirely accounted in terms of social class and ability (DiMaggio 1982; Bourdieu 1986). Cultural capital is defined as the resources available to individuals because of their knowledge and familiarity with the upper class culture (Dumais 2002), and their ascription to the dominant high-class values, customs and preferences (Bourdieu 1986) that become unconsciously manifested in daily actions as "traits," "tastes," and "styles," (DiMaggio 1982).

Research shows that in spite of middle class Black families' advantages because of their class position, they get fewer benefits as a result of their social class than Whites (Lareau and Horvat 1999). Also, research shows that Black and low SES students receive less return for their cultural capital than Whites and high SES students (Farkas 1996; Roscigno and Ainsworth-Darnell 1999).

Students with more cultural capital have better ways of communicating with teachers and feel more comfortable at school (Dumais 2002) because schools' linguistic structure, authoritative patterns and curricula correspond to those patterns observed in the dominant class (Lareau 1987). Teachers and school personnel highly value upper class cultural patterns, preferences, attitudes and behaviors (Roscigno and Ainsworth-Darnell

1999) and therefore, develop positive attitudes toward students with high levels of cultural capital. Parents with more human capital handle school decisions about their children's placement in special programs, teacher assignments and retention more proactively than working class or poor parents (Stevenson and Baker 1987; Horvat, Weininger et al. 2003).

Moreover, disadvantaged children have less access to educational opportunities in their homes and in their schools (Downey, von Hippel et al. 2005). Low SES students are more likely to go to lower quality schools, and to schools with fewer resources in terms of teachers quality, class size, outreach programs among other resources (Portes and MacLeaod 1996; Lee and Burkham 2002). They are also more likely to attend school with high concentration of minority students, low SES students, language and race/ethnic minorities (Roscigno 1998; Schmid 2001; Van Hook and Stamper Balistreri 2002; Van Hook, Brown et al. 2003).

Particularly, in 2000, Latino students were more likely to attend schools with predominantly low SES and ethnic minority students (Frankenberg and Orfield 2003; Rumberger and Palardy forthcoming). For instance, the average Latino student attended school where at least 44% of the student body was poor compared to White students who attended schools where only 19% of the student population were below the poverty line (Frankenberg and Orfield 2003). Hispanic, immigrants and English learner, students are also more likely to be concentrated in vocational and less academic tracks (Callahan 2005; Marks 2005). Padilla and Gonzalez (2001) reported that Mexican students in college track have significantly higher GPA than those students in general track.

Moreover, Orfield and Yun (1999) found that Latino students are more likely to be segregated and that this tendency has increased over time. Hispanic students experience even more isolation from White students than Black students (Orfield and Yun 1999). First generation immigrants are also more likely to enter schools with high immigrant concentration (Marks 2005). The segregation experience by Hispanic students is not only in the lines of economic segregation. They are also more likely to attend schools with a high concentration of non-English proficient students (Crawford 1997; Schmid 2001; Van Hook and Stamper Balistreri 2002; Van Hook, Brown et al. 2003).

Attending schools with high concentration of minority students – immigrant, racial/ethnic, socioeconomic, and non-English proficient students, is related to low school quality and lack of resources. These schools are commonly characterized by low qualified teachers –uncertified and less experienced, less than average academic achievement student body, mental health problems, low funding, inadequate community support, insufficient school counselors; among other characteristics (Portes and MacLeaod 1996; Valencia 2002; Gándara, Rumberger et al. 2003; Callahan 2005; Crosnoe 2005; Marks 2005).

After reviewing this literature, it is evident that Latino students' economic disadvantages are translated into educational disadvantages through mechanisms occurring at the family and school levels. In addition to their low SES, Latino students also suffer from the lack of English proficiency, a subject that I will turn to in the next section.

Hispanics' Language Characteristics and English Ability Effects on Hispanic Students Educational Achievement

Research shows that Latinos are more likely to continue using their native language (*i.e.* Spanish) after arriving into the U.S. than any other racial/ethnic group (Alba and Nee 2003). On average, Latinos show significant attachment to their native language, but mainly speak English in their homes (Portes and Rumbaut 2001; Alba and Nee 2003). As could be expected, the use of English as a main language of communication is related to individual's generational status. Latino foreign-born parents often use Spanish in most areas of interaction, including in their communication with their second generation children. However, by third generation, a pattern of language shift is discovered. This language shift may not be found in communities with extremely high concentration of Hispanics because of the continuing flow of new immigrants into those communities (López 1999; Alba and Nee 2003).

In 1999, 57% of Latinos between kindergarten and 12th grade speak mainly English at home. About 25% speak mostly Spanish at home and 17% speak both English and Spanish (NCES, 2003). Puerto Ricans are more likely to speak only English at home (25%) compared to 21%, 14%, and 11% of Mexicans, Cubans, and South Americans respectively. Less than 8% of Central Americans and Dominicans speak only English at home (Ramirez, 2004). Among those Latino groups that speak both Spanish and English at home, Puerto Ricans are the most likely to be English proficient. Cubans and South Americans are likely to be either English proficient or non-English proficient. Central

Americans and Dominicans are more likely to be non-proficient in English (Ramirez 2004).

Latino children are over-represented among students with English difficulties, in Bilingual, and English Limited Proficiency programs. Almost one-third of Latino students are learning English as a second language, accounting for 75% of the Limited English proficient (LEP) students in schools. However, this proportion increases in states with greater concentration of Latinos. In California, for instance, 40% of kindergarten and first grade students are English language learners (Gándara 1999).

Variables such as language at home, English proficiency, bilingualism, language support programs, has been related to Hispanic students' educational disadvantages (Carliner 1995; Winsler, Diaz et al. 1999; Padilla and Gonzalez 2001; Gándara, Rumberger et al. 2003). Language use at home and English knowledge have particular consequences for Latino children's educational experiences. Limited English proficiency (LEP or EL) students have significantly lower scores than native English speaking students in several content areas and at different grade levels (Thomas and Collier 2002; Gándara, Rumberger et al. 2003; Callahan 2005). For second-generation immigrants, English proficiency increases math and reading test scores as well as educational and occupational aspirations (Portes and Schauffler 1996). Gándara and colleagues (2003), after analyzing California students' performance in the SAT reading test applied between 2nd and 11th grade, found that EL students show lower reading scores in all grades. These researchers also report that half of the California kindergartners coming from English speaking homes have reading, math and general knowledge scores above the 50th percentile in the fall assessments, compared to only 17% students from non-English

speaking homes. Callahan (2005) supports these findings, showing that EL students have scores 1.2 standard deviations lower than English proficiency students in 8th grade reading NAEP in 1998 and 2002.

Particularly for Hispanic and immigrant children, language barriers and the lack of English skills commonly explain their low educational performance (Rosenthal, Baker et al. 1983; Padrón, Waxman et al. 2002; Ream 2003). Hispanic students not only face the challenges of mastering a new language, they have to acquire the expected academic skills for each grade level (Genesee; Garcia 2001). Thus, it is expected that Hispanic students will have low performance if they do not have minimum levels of English proficiency (Rosenthal, Baker et al. 1983).

The cultural discontinuity theory is used to explain Hispanic students' low performance based on the "language discontinuity" between Hispanic homes and U.S schools that generate misunderstanding and inferior learning patterns (Suárez-Orozco 1998). Rong and Grant (1992) considered that language, culture, and interaction conflicts between U.S schools and immigrant families negatively impact immigrant children's educational experiences. Moreover, this theory predicts that the length of residence in the U.S. and acculturation to U.S. schools could increase immigrant students' educational performance. Indeed, Rong and Grant (1992), in trying to explain educational attainment differences between Hispanic, Asian and non-Hispanic White students from different generations, concluded that Hispanics' overall patterns of attainment are highly related to cultural discontinuity postulates.

Lack of English proficiency directly interferes with learning processes. Specifically, where teachers use English as the only language of instruction, students

need minimum oral English skills to understand contents of instruction, to be exposed to meaningful learning interactions, and to be engaged in inquiring processes that furthers learning (Rosenthal, Baker et al. 1983; Henderson and Landesman 1992). In addition, inside the classroom, English ability is needed for students to be engaged if most of instruction is conducted in English. Indeed, being engaged in the learning process is essential for acquiring academic skills; if meaningful language interactions are not present, acquiring this skill will be extremely difficult (Gándara 1999).

Particularly for Hispanic students, English proficiency might be related to young children's cognitive development if they have good linguistic commands in their native language. Being bilingual, with similar levels of competence in both languages, is associated with cognitive and linguistic advantages. Bilingualism has been associated with greater cognitive flexibility, better classification and reasoning skills, and increased awareness and control over language (Krashen 1999; Winsler, Diaz et al. 1999; Cummins 2000).

Additionally, English proficiency not only impacts learning outcomes directly, but also indirectly. Research recognizes several indirect negative impacts, such as, the placement of LEP students in special education classes offering less rigorous academic and linguistic education (Schmid 2001; Callahan 2005); because these students are commonly stereotyped as underachievers with attention and learning disorders, and are therefore placed in remedial classes (Schmid 2001). Further, among high school students in California, English learners are less likely to be in college tracks; therefore, their possibilities of college attainment are truncated (Callahan 2005).

Moreover, non-English proficient students do not have access to qualified teachers that have been specially trained to teach students with lack of English proficiency (Schmid, 2001; Gándara et al, 2003). English learners are more likely than any other children to be taught by teachers that are not fully certified or that are not qualified to teach EL. Padrón and collaborators (2002) reported that less than 20% of teachers with EL are certified as English as Second Language (ESL) or bilingual teachers.

Also, EL students are more likely to be segregated *between* and *within* schools. Gándara and collaborators (2003) reported that Californian EL students are more likely to attend schools with high concentration of non-proficient English students. At the same time, EL students are not commonly evenly distributed in classes. Being segregated in classes interferes with EL students' learning opportunities because they have limited possibility of interacting with English-proficient students. This prevents the further development of their English skills and limits their access to high-achiever peers, and hence, potential good role models (Gándara, Rumberger et al. 2003).

Empirical research on the effects of students' English ability and SES shows that one of the mechanisms through which these variables impact Hispanic students' educational outcomes is through differences in access to resources within and between schools. Students spend a great amount of time in schools, which main objective is to increase knowledge and skills. The next section of this chapter deals with the role of schools as institutions for Hispanic students' learning experiences.

The Role of Schools as Institutions for Hispanic students' educational achievement

Despite their extensive use for explaining Hispanic children's educational outcomes, both assimilation theories and cultural argument failed to fully explain the existing evidence about their educational outcomes. In particular, these theories overlook the role that schools have on shaping Hispanic students' educational achievement. For example, cultural arguments only emphasize the importance of school for reproducing social inequalities among racial/ethnic groups. Both Segmented Assimilation and new assimilation theories reinforce the importance of institutions as entities for shaping and regulating mechanisms of assimilation, although these theories focus on nation-state and labor markets as the primaries institutions that impact assimilation processes.

After the "Coleman Report" (1996) and Jencks and colleagues research (1972), research started to recognize the importance of schools in shaping students' educational outcomes. Two opposite perspectives of thinking were born. One perspective emphasized that schools are only important as agents for social reproduction and inequalities. Schools, by acknowledging the dominant high-class values, customs, and by assuming standards and practices already familiar to the dominant high-class, reinforced the current power structure and the supremacy of the dominant class (Bourdieu 1986; Valenzuela and Dornbusch 1994; Lareau 1996; Lareau and Horvat 1999; Valencia 2002). Consequently, it could not be expected that schools have any positive influence on minority students' –including Hispanics– educational outcomes and opportunities for upward mobility.

The other theoretical perspective emphasized that schools show positive effects on learning and that they contribute in reducing educational inequality between low and high SES students. For example, Entwisle and Alexander (1989) found that schools have an independent impact on learning even after controlling for family characteristics. In addition, Cooper and collaborators 91996) found decreases in math learning during the summer compared to learning experiences occurred during the school years and that summer negative effects increase in subsequent years.

Evidence about the impact of schools on young children cognitive skills is also found in the psychology literature where most of this research compared differences in cognitive skills test scores in subsequent grades (kindergarten and first grade or first and second grades) after controlling for students' developmental stage (age). For instance, evidence from Cahan and Davis (1987) work supported the relationship between additional years of schooling and math and reading comprehension test scores and Morrison and collaborators (1995) research supported the importance of schooling for developing memory skills. Also Cahan and Cohen (1989), and Ceci (1999) found that schooling is an important factor in accounting for children's intelligence, verbal skills and those cognitive processes underlying intelligence differences.

Moreover, research found that schools are importance for neutralizing low SES students' educational disadvantages (Heyns, 1978; Entwisle & Alexander, 1992, 1994; Alexander & Enstwisle, 1996; O'Brien, 1999). For instance, Alexander and collaborators (2001), after comparing differential learning rates during the summer and the school year of low and high SES students, concluded that schooling neutralize minority students' educational disadvantages which particularly increased during the summer. Similarly,

Downey and collaborators (2005) found that schools accelerate learning and neutralize students' socioeconomic status initial disadvantages by "*increasing average learning rates, reducing variance in learning rates and by reducing tendencies of for initial advantages to compound over time."*

Schools described as "*supportive school community"* show positive effects on minority students' educational outcomes (Griffith 2002; Borman and Overman 2004). For example, Borman and Overman (2004) found that low SES students attending elementary schools showing *ethic of caring,* concern about the psychosocial adjustment of students, and support in their learning processes had higher math test scores that those students attending schools that do not share these attributes. Also, Griffiths's (2002) research showed smaller GPA gaps between low and high SES students attending schools that emphasized quality of academic instruction that at the same time cultivated good interpersonal relationship between teachers and students, sense of community, and high commitment to school success.

Additional research focused on both within-school and between-school factors for explaining differences in students' educational outcomes (Reardon, 2003). Within-school factors referred to differences in treatment received by students because of their individual characteristics and between-school factors referred to conditions associated to different schools, including access to resources and segregation for example. Tracking – including LEP special placement, and teacher expectations – including teachers' practices and interactions with students are the most common within-school variables associated to Hispanic students' low educational performance. In addition, schools segregation is the most common between-school explanations use to explain Hispanic students low

educational performance. Because school segregation is highly related with low school quality and lack of resources is not surprising that it has been a common explanation for students' low achievement (Valencia, 2002).

Because my study analyze math outcomes while students are in kindergarten, first grade, and between first and third grade, it is particularly relevant to take into account grade specific characteristics that may impact students' educational outcomes. Research shows that kindergarten and first grade have different characteristics. Kindergarten classrooms are considered less structured and less academic oriented than first grade classrooms (Alexander, Entwisle et al. 1993; La Paro, Pianta et al. 2000; Burkham, Ready et al. 2004). Additionally, Pianta and collaborators (2000) found important variability across kindergarten classrooms in educational activities, teacher behaviors, and time allocation to different types of instruction; variability that can be related to the lack of agreement about the role of kindergarten as having mainly a learning or socialization function (Burkham, Ready et al. 2004). Consequently, differences in grade characteristics could be extremely important for explaining learning outcomes. Especially for Latino students who have lower cognitive skills than White and Black children at kindergarten entry (Zill, Collins et al. 1995; Lee and Burkham 2002; Rumberger and Arellano 2004; Rouse, Brooks-Gun et al. 2005)

Summary and Conclusions

In this chapter, I discuss the most relevant theoretical approaches used in explaining Hispanic students' low educational attainment. I begin this chapter by

discussing assimilation theories and cultural arguments. Further, I analyze recent literature about school effects and current research on SES and English ability effects on Hispanic students' educational outcomes and the mechanisms through which these variables affect students' performance. Integrating these different theoretical perspectives enriched my discussion about Hispanic students of different countries of origin and generational status by taking into account mechanisms occurred at individual and macro levels. At the same time, this research improves previous studies on Hispanic students' educational disadvantages by incorporating schools as the context where these macro and micro levels converged.

From assimilation theories we learn that Hispanic students' educational outcomes can either improvement or decrease over time and across generations. Classic theories of assimilation argued that new comers become part of the U.S regardless of race/ethnic, social and economical characteristics; over time they will show similar educational and economic outcomes as to those observed in White middle class individuals. In contrast, Segmented Assimilation theory postulated that immigrants experienced different path of assimilation which depend on their immigration experiences, length of residence in the host country, and settlement processes, to explain their adaptation processes to the U.S society (Portes and Zhou 1993; Zhou 1997; Portes and Rumbaut 2001; Alba and Nee 2003).

From the new assimilation theory (Alba and Nee 2003) we learn that assimilation is only one possible outcome and that is not necessarily related to social mobility. This theory emphasizes the importance of economic and educational capital to define in which levels of the upward mobility ladder immigrants will begin their assimilation process.

Alba and Nee (2003) argued that assimilation is a dynamic and incremental process that could evolve for later generations or within generations that progresses overtime. Consequently, we can observe different rates of assimilation based on the forms and amount of capital in different ethnic/racial groups.

Cultural arguments related educational outcomes to power relationships between minority and majority groups, and to minority positions within the U.S social structure. For instance, the Cultural Ecology theory predicts that racial/ethnic groups who were incorporated into the U.S. by force developed negative perceptions about mobility opportunities, and resisted any behavior or outcome commonly accepted by the mainstream group. Further, the Cultural Discontinuities theory explains minority students' low performance by mismatches in communication, language, and other cultural expressions occurring in schools (Suárez-Orozco 1998).

After revising the empirical literature about English ability and SES on impacts on educational outcomes, we learn how important these variables can be for Hispanic students' educational outcomes. Demographic and educational data show that Hispanics in the U.S, on average, are non-English proficient and live in poverty, and that these characteristics differ by Hispanic country of origin and generational status (U.S.-Census-Bureau 2000; Portes and Rumbaut 2001; Ramirez 2004).

Empirical evidence supports the direct relationship between SES and educational outcomes. Students from low socioeconomic environments are more likely to obtain lower grades and test scores, are less likely to be retained and are more likely to drop out from high school than those from economically advantaged families (Entwisle and Alexander 1993; Garcia 2001). Similar evidence is found for limited English proficiency

students compared to English proficient students (Portes and Schauffler 1996; Thomas and Collier 2002; Gándara, Rumberger et al. 2003; Callahan 2005). Both economically and linguistically disadvantage students are even more likely to attend schools that give them fewer educational opportunities (Garcia 2000; Gándara, Rumberger et al. 2003; Downey, von Hippel et al. 2005).

After the 60s, two antagonistic schools of thoughts related schools as institutions to students' educational outcomes. One perspective emphasized that schools were only agents for social reproduction (Bourdieu 1986; Valenzuela and Dornbusch 1994; Lareau 1996; Lareau and Horvat 1999; Valencia 2002). The other theoretical perspective underlined that schools contributed in reducing educational inequality by having positive effects on learning (Entwisle and Alexander 1989; Entwisle and Alexander 1993; Alexander, Entwisle et al. 2001; Griffith 2002; Borman and Overman 2004; Downey, von Hippel et al. 2005) .

Particularly important for my research on Hispanic students' math outcomes between kindergarten and third grade are those research findings that related differences in grade characteristics to learning outcomes (Zill, Collins et al. 1995; Lee and Burkham 2002; Rumberger and Arellano 2004; Rouse, Brooks-Gun et al. 2005).

CHAPTER 4

RESEARCH QUESTIONS

This research expands current discussions on racial/ethnic educational inequalities by focusing on Hispanic students' math achievement patterns in the early school years. Math achievement is chosen as the main outcome variable for this study because math represents in-school learning more so than other types of achievement. Also, this outcome variable is selected for this study because Hispanic students took math achievement test in all waves of data collection. This was not the case for Reading and General Knowledge tests taken by oral English proficient Hispanic students only.

Further, this dissertation contributes to the formulation of policy and strategies to improve Latino students' educational performance by providing relevant information about their educational experiences.

By analyzing Hispanic subgroups' math learning trajectories in the early school years, and the association between math trajectories and SES and English ability, my dissertation expands previous research on racial/ethnic educational experiences and also fills important gaps in the literature about Hispanic students' educational experiences. My research focuses on the most predominant minority group significantly impacting the U.S population growth (Martin and Midgley 1999; Martin and Midgley 2003) and which is considered a high risk group due to their low levels of educational attainment and high levels of poverty (Hirschman 2001; Lee and Burkham 2002; Van Hook and Stamper Balistreri 2002; Fry 2003; Kao and Thompson 2003; National-Center-for-Education-

Statistics 2003; Reardon 2003; Rumberger and Arellano 2004). Thus, the following are two questions address in my dissertation:

- What are the average Hispanic students' math learning trajectories in the early school years?
- How do math achievement patterns differ among Hispanic subgroups by country of origin and generational status?

Moreover, my research focuses on the most important variables associated to Hispanic students' educational outcomes: SES and English ability. Research recognized the direct impact of these variables on Hispanic students' educational outcomes, and identified several mechanisms through which these variables indirectly affect students' achievement (Coleman, Hobson et al. 1966; Lee and Burkham 2002; Kao and Thompson 2003). For instance, SES commonly explains race/ethnic and generational differences in students achievement (Crosnoe 2005; Marks 2005) and English ability has been significantly associated to lower scores in several content areas and at different grade levels (Thomas and Collier 2002; Gándara, Rumberger et al. 2003; Callahan 2005). The following research questions is also ascertain in this study:

- Are differences in SES or English ability related to Hispanic subgroups' math achievement patterns differences?

To describe average Hispanic students' math learning trajectories in the early school years and how these math achievement patterns differ among Latino subgroups, I analyze overall Hispanic students math learning trajectories between kindergarten and third grade. I also investigate math achievement patterns for each Hispanic subgroup. I decompose math learning trajectories in math score at kindergarten entry and three

growth rates: during kindergarten, during first grade, and from first to third grade. Further, Hispanic subgroups' math achievement patterns are contrasted to those observed for native non-Hispanic White and native non-Hispanic Black students, to frame my discussion on Hispanic students' educational outcomes within broader patterns of racial/ethnic educational inequality.

To analyze if differences among Hispanic subgroups' math achievement patterns are related to differences in immigration processes, SES, and/or students' English ability, I study the unconditional and conditional associations between their math achievement patterns and SES and English ability. Also, the analyses of their immigration processes is key in framing the discussion of the association of these variables, given that each generation represents different waves of immigration with diverse family SES and English ability characteristics. Further, I explore whether these variables accounted for the White – Hispanic math achievement differences.

My dissertation, by analyzing Hispanic subgroups' math learning trajectories in the early school years, and the association between these math trajectories and SES and English ability, expands previous research on racial/ethnic educational experiences and fills important gaps in the literature about Hispanic students' educational experiences. My research focuses on the most predominant minority group which is impacting significantly the U.S. population growth (Martin and Midgley 1999; Martin and Midgley 2003) and is considered a high risk group due to their low levels of educational and high levels of poverty (Hirschman 2001; Lee and Burkham 2002; Van Hook and Stamper Balistreri 2002; Fry 2003; Kao and Thompson 2003; National-Center-for-Education-Statistics 2003; Reardon 2003; Rumberger and Arellano 2004).

Also, Latinos are a diverse population, coming from distinct countries of origin, with different characteristics (i.e. English ability, educational and poverty levels), and different immigration experiences (Guzman 2001; Larsen 2004); Ramirez 2004). Consequently, my research takes into account the diversity of the Latino population by disaggregating Hispanic students by country of origin and generational status. Hispanic students are classified as Mexicans, Puerto Ricans, Cubans, South Americans, Central Americans or Other Hispanics. Further, Hispanic students from different generational statuses are classified as: 1) First generation students – foreign-born with foreign-born parents; 2) second generation students – native-born to foreign-born parents; and 3) third generation individuals – native-born to native-born parents of Hispanic origins. By taking into account diversity in country of origin and generational status, I am able to identify patterns and variations in math achievement across Hispanic subgroups as opposed to estimating a global measure.

Further, my dissertation expands previous research on SES and English ability effects on Hispanic students' educational outcomes by analyzing their relative importance for explaining students' math achievement differences. Identifying whether English ability or SES has stronger explanatory power or whether the association of either variable is eliminated by including the other in the model are key issues for understanding Hispanic students' math achievement patterns.

Moreover, my research incorporates Hispanic subgroups' immigration experiences and processes as the theoretical framework to explain differences in math achievement patterns. Particularly, English ability and SES effects are heightened by Hispanic immigration experiences and processes. As discussed in Chapter 2, Hispanic immigration

histories and experiences have significant consequences for differences in English ability and SES. Immigrants' "context of reception", including U.S. governmental policies and support, access to resources because of solid ethnic enclaves, and perceptions of the native citizens can either facilitate or impede upward mobility opportunities (Rumbaut 1997). At the same time, ethnic community characteristics wherein immigrants settled can reinforced or restrain English use. Thus, in this research I try to relate two different schools of thoughts (sociology of education and immigration) to enrich the interpretations of my results.

Linking Research Questions to the Literature Review

Possible answers to my research questions can be garnered from previous discussions in Chapters 2 and 3. Based on immigrants' assimilation theories and cultural arguments, Hispanic subgroups' math achievement patterns could be projected.

For instance, Classic theories of assimilation predicted immigrant assimilation over time and over generations regardless of country of origin or racial/ethnic group. These theories argued that immigrants of different sending countries assimilated into the U.S society and became alike to U.S mainstream individuals over time. The rationale being that immigrants become assimilated into the U.S. society due to generational succession, length of residence, and integration with local institutions (Park 1950; Gordon 1965). Based on this theory, one could expect better educational outcomes for each subsequent generation and within each generation over time regardless of their country of origin and other characteristics (e.g. initial educational outcomes, familiarity

with schools, economic status and English ability). Also, one would expect convergence of math outcomes between White students and third^{+} generation Hispanic students regardless of country of origin and other characteristics.

In contrast, the Segmented Assimilation theory predicted improvement of math outcomes over time and by generational status for certain ethnic/racial groups and declining outcomes for certain other ethnic/racial groups (Gans 1992; Portes and Zhou 1993; Zhou 1997; Portes and Rumbaut 2001). Those students whose families experienced a *positive context of reception* (e.g. governmental support, solid ethnic communities, and acceptance by the local population), and who are able to cope with the receiving society's social and economic barriers should reach similar math outcomes as those observed for White middle class students. Based on the Segmented Assimilation theory, one would expect differences in math outcomes across Hispanic groups depending on their immigration experiences, acculturation processes, and barriers and resources for assimilation. Consequently, one could expect downward trend of math achievement overtime and across generation, or stable low educational outcomes for some racial/ethnic groups, particularly for Mexicans and Central American students. These is because these particular Hispanic groups not only come to the U.S with low levels of human capital, they also do not experience positives context of reception and modes incorporation. They are confronted with lack of opportunities for upward mobility, experience prejudice and discrimination, and are not received by solid ethnic enclaves.

Based on the Optimism hypothesis (Kao and Tienda 1995), one could expect higher math outcomes for second generation Hispanic students than for first and third^{+}

generation Hispanic students. This hypothesis stipulated that the second generation obtains the best of both worlds: their own culture and the benefits offered by the receiving society. Thus, these students would have better educational outcomes because of positive home environments, strong parental support, and English ability.

Among the cultural arguments, Ogbu's Cultural Ecology is the most commonly used to explain Hispanic students' educational outcomes. This theory argued that involuntary minorities, regardless of their generational status, neither achieve upward mobility nor reap equal rewards for their educational achievement as the dominant population. Thus, involuntary minorities exhibit negative attitudes towards schools and high performance standards and therefore show low educational achievement. Mexican and Puerto Rican students, because they were incorporated to the U.S. through conquest, are examples of involuntary minorities.

Thus, different math achievement patterns could be expected based on the previous immigrant assimilation theories and cultural arguments. If Classic theories of assimilation are accurate, one could expect that Hispanic students' math achievement will improve overtime becoming similar to White students' regardless of country of origin. Also, one could expect higher math achievement for third generation Hispanic students than for their first and second generation counterparts. In contrast, if the Segmented Assimilation theory is accurate, one would expect that Mexican, Puerto Rican and Central American students will have lower math achievement than Cuban and South American students, experiencing downward achievement trend over time. A scenario of upward math achievement trends is expected for Cuban and South American students and similar math outcomes to those of White students. At the same time, based on the

Segmented Assimilation theory one could expect decreasing math achievement by generational status for Mexican, Puerto Rican and Cuban students, and better or similar math achievement by generational status for South American and Cuban students. Finally, if the Optimism hypothesis postulates are accurate, one could expect better math achievement among the second generation regardless of country of origin because they benefit from their solid home environments and their good English skills.

Based on Hispanic subgroups' immigration processes and the literature review on SES and English ability effects on math educational outcomes analyzed in the previous chapters, different alternative scenarios of the association between these variables and math achievement patterns could be observed.

As analyzed in Chapter 3, both English ability and family SES are key issues for understanding Hispanic students' educational outcomes. Differences in SES levels could explain math achievement differences between White and Hispanic students, as well as differences observed among Hispanic subgroups. Differences in English ability could be particularly important also in comprehending educational achievement differences among Hispanics of different countries of origin and generations. Consequently, one could expect that Hispanic students with better English skills or those from families with higher SES levels would show higher educational outcomes than those students with lower levels of English ability or lower SES.

Moreover, English ability and family SES effects might vary by country of origin and generational status. Research confirm that students from low socioeconomic environments are more likely to obtain lower grades and to drop out from high school than those from economically privileged families (Entwisle and Alexander 1993; Garcia

2001). I expected family SES to explain more of the White – Mexican, White – Puerto Rican, and White – Central American students' gaps than of the White – Cuban and White – South American students' gaps because the SES differences among Mexicans, Puerto Ricans and Central Americans are more substantial than for Cubans and South Americans. Based on the same logic, I expected a stronger association between SES and math achievement for first generation Hispanics than for subsequent generations.

Research also demonstrate that language barriers and the lack of English skills commonly explain Hispanic students' low educational performance (Rosenthal, Baker et al. 1983; Padrón, Waxman et al. 2002; Ream 2003). Among Hispanics, Puerto Ricans have higher English skills. Particularly low English skills are observed for Mexican and Central American students (Ramirez 2004). Consequently one would expect lower English ability effects for Puerto Ricans than for the remaining Hispanic students. Based on the school effects discussion presented in Chapter 3, I hypothesize different effects of English ability and SES at the beginning of kindergarten and while schools are in session. Because at kindergarten entry students are not yet enrolled, I expect stronger individual/family variable effects then than in later years. Additionally, one could expect greater effects of SES and English ability on math achievement during kindergarten than in later grades because kindergarten is less structured and academic oriented (Alexander, Entwisle et al. 1993; La Paro, Pianta et al. 2000; Burkham, Ready et al. 2004). Also, because there is more variability in educational activities, teacher behaviors and time allocation across kindergarten classrooms (Pianta, La Paro et al. 2000), one would expect stronger effects from individual/family variables than from school characteristics.

In the following chapter, I present the methodology followed in my research, main findings, and answers to the research questions formulated in this chapter.

CHAPTER 5

DATA AND METHODS

Data

The Early Childhood Longitudinal Study (ECLS-K)

The data for this study comes from the Early Childhood Longitudinal Study (ECLS-K) – Kindergarten Class of 1998-99, sponsored by the National Center for Education Statistics.[3] The ECLS-K is a relatively new data that focuses on young children's cognitive and non-cognitive growth, school readiness, health, and transitions to non-parental care, kindergarten and educational programs. Using several collection techniques –class observations, surveys and checklists; and distinct sources of information –parents, teachers and principals; the information gathered in this study relates a comprehensive set of contextual variables to children's development and educational experiences. Information regarding family, school, community, and student characteristics; as well as direct cognitive assessments, such as, math, reading, and general knowledge are collected. The ECLS-K study aims to gather six waves of data between 1998 and 2004; fall and spring of kindergarten, fall and spring of first grade, and spring of third and fifth grades. In the fall of first grade, the sample was intentionally

[3] This chapter is mainly drawn from the "User's Manual for the ECLS-K Third Grade Restricted-Use Data File and Electronic Codebook", "Psychometric Report for Kindergarten through First Grade" and web page: http://nces.ed.gov/ecls. For any additional details refer to these sources.

reduced to 30% of the original sample of schools because of budget restrictions. In this wave, only achievement measures and parents' questionnaires were collected. As of today, only the first 5 waves of data have been released.

The ECLS-K data is well suited for the purpose of my research for the following reasons. First, the ECLS-K study is one of the very few nationally representative studies that collect data on young students. This population is the main focus of my dissertation. Second, the ECLS-K data allows measuring achievement scores at different points in time. It also permits researchers to study academic skills at the beginning of formal schooling at the kindergarten level, and the academic skills acquired during early grades. Third, the data has a sizable sample (approximately 3,500) of Hispanic children for whom information about country of origin and place of birth are available in most cases. Thus, the ECLS-K data is well suited for a study on Hispanic young children's academic skills and how they vary by the country of origin and place of birth.

ECLS-K Study Sampling Design

The ECLS-K study gathers a nationally representative sample of approximately 20,000 kindergarteners in the 1998-99 class who are followed until 2004 when most of the students are in 5th grade. This study uses a multistage probabilistic sampling design that includes three main primary sampling units: 1) counties or group of counties, 2) schools, and 3) students.

One hundred counties or group of counties were selected with a probability proportional to their size, based on the number of five-year-old children living in these counties. The twenty-four counties with the biggest population were independently included in the sample as part of the one hundred counties. The remaining counties were selected from eight strata based on the Northeast, Midwest, South, and West Census regions and metropolitan statistical area. In addition to the twenty-four counties selected, the final sample of counties included fifty-two counties from metropolitan areas and twenty-four from non-metropolitan areas. Information about minority population, size, and income were also considered for the selection of the remaining counties.

The next step was to sample schools within each county or group of counties. Using a systematic selection procedure with probability proportional to school size, the ECLS-K study includes 1,280 private and public schools. The sampling frame was based on 1995-96 Common Core of Data (CCD), Private School Universe Survey (PSS), Bureau of Indian Affairs, and the Department of Defense lists of schools. In addition, the sampling frame was also based on a new list of schools recently offering kindergarten programs.

Finally, approximately twenty-four students were selected from each school using equal probability and systematic sampling procedures from the list of all kindergarten students. To guarantee enough sample size for different analyses, the ECLS-K over-sample private schools, Asian-Pacific Islander children, and students in private schools. Note that ECLS-K sample is representative of the cohort of students in kindergarten in the fall of 1998.

Approximately 22,000 students were selected to participate in the ECLS-K study. The final sample size consisted of 19,684 students in the fall of 1998; 20,578 students in the spring of kindergarten; 5,650 students in the fall 1999; 17,324 in the spring of first grade; and 15,305 students in the fall of third grade. Note also that 165 new students were added to the sample in the spring of first grade. The *"refreshment component"* consists of students living outside the U.S. during kindergarten, or those who were not selected for the kindergarten sample.

Although the ECLS-K did not follow every student who changed schools, special efforts were made to follow students that changed schools to avoid significant reduction in the sample size and to guarantee the longitudinal nature of the data. The decision of which students would be followed depended on the new schools they went to. First, the schools where students moved to were identified; 50% of these schools were followed in spring of first and third grade. In third grade, all language minority students were followed. Of the 19,684 students, 2,850 were not followed in first grade and 4,117 were not followed in third grade.

Study Sample

From the ECLS-K, the present study uses five waves of data collected in the fall and spring of kindergarten, fall and spring of first grade, and spring of third grade. My longitudinal sample includes Hispanics of any race, Black, and White students. The remaining racial/ethnic groups are excluded, as are White and Black children with foreign-born parents. White and Black students are included mainly for comparative

purposes. To avoid any confounding effect on their math learning trajectories, I exclude those White and Black students with foreign-born parents. The sample is also limited to students with complete information regarding ethnic/race, country of origin, and generational status.

Of the 15,305 students on the ECLS-K kindergarten and third grade longitudinal sample, my final sample includes 11,623 students. The remainder are dropped from my sample because of the following reasons: i) 52 students had missing math scores at all waves; ii) 717 were White students with foreign-born parents, 278 were Black students with foreign-born parents, and 1,838 students were members of other races; iii) 122 cases had missing data on time, 514 on Hispanic country of origin, and 224 on generational status variables.

The final sample size for this study includes students who are Hispanic, native non-Hispanic White, and native non-Hispanic Black students. The final sample includes first time and second time kindergarteners, and students whose kindergarten status is unknown. It also incorporates students who changed and did not change schools between grades, as well as students with missing information for SES and language variables.

From the 11,623 students in this study sample, 3,004 students have test scores for all five waves and 7,067 students have test scores for four waves. The numbers of students with three, two, and one test scores are 1,038, 400 and 113 respectively. Remember that it was a sampling decision to follow only 30% of the kindergarten sample of schools in the fall of first grade.

Table 5.1 shows the sample size for this study by race/ethnicity, Hispanic countries of origin, and generational status. Because the sample size by generational

status is small, I focus on Mexican students and on second generation students from different countries of origin.

Table 5.1

Sample Size for this Study (unweighted)

	Gen 1	Gen 2	Gen 3+	Total
Race / Ethnicity				
Whites				7,691
Blacks				1,611
Hispanics	194	1,472	655	2,321
Hispanics by country of origin				
Mexico	129	934	448	1,511
Cuba	8	55	19	82
Puerto Rico	12	90	102	204
South America	20	110	0	130
Central America	16	220	0	236
Hispanic Other (not mex, prto, cb)	9	63	86	158
Total				11,623

This current sample of analyses includes 2,321 Hispanic students, which represent 59.94% of the original number of Hispanics in the kindergarten – first grade longitudinal sample (4,006 students). From those 1,685 Hispanics not included in my analytical sample, 1,092 do not have re-scaled math test scores based on the third grade math assessment because they were not followed into third grade. In addition, 34 cases have missing data on the time variables, 514 missing cases on Hispanic country of origin, and 45 missing data on generational status. Table 4.2 compares the Hispanic analytical sample used in this study and the Hispanic sample excluded in terms of the main variables of interest. Students in the Hispanic excluded sample are more likely to be either second or third^{+} generation, which have important consequences for the remaining

variables. As expected, Hispanic students excluded from my analytical sample have higher SES and English ability levels than Hispanic students included in my analytical sample. Hispanic students included in the analytical sample are less likely to live in English speaking homes and to change schools than those excluded in my analytical sample. In addition, Hispanics in my analytical sample tend to be older than those Hispanic students not included in my study. In terms of test scores, overall, there are not many differences between the two samples.

Table 5.2

Comparison of Hispanics in the Analytical Sample to Those Excluded (unweighted)

	Analytical Sample (2,321)	Sample excluded (1,685)	Significant Difference
Generational Status (%)			
First	8.36	5.04	
second	63.42	6.05	***
third +	28.22	26.77	
second or third +	0.00	40.30	
Gen unknown	0.00	21.84	
Hispanic country origin (%)			
Mexican	65.10	12.11	
Cuban	3.53	0.89	
Puerto Rican	8.79	2.31	***
South American	5.60	1.01	
Central American	10.17	2.02	
Hsp Other	6.81	1.42	
Hps Unknown	0.00	80.24	

	Analytical Sample (2,321)	Sample excluded (1,685)	Significant Difference
Math scores (third grade re-scale scores)			
wave 1	17.57	18.68	**
	(0.16)	(0.31	
wave 2	27.05	28.09	*
	(0.22)	(0.41)	
wave 3	32.80	32.85	
	(0.45)	(0.90)	
wave 4	49.60	50.52	
	(0.31)	(0.62)	
wave 5	79.33	78.32	
	(0.38)	(0.74)	
Time variables			
During kindergarten	7.64	7.55	*
	(0.02)	(0.04)	
During the summer	1.25	1.28	
	(0.01)	(0.02)	
During first grade	4.31	4.20	+
	(0.02)	(0.05)	
During third grade	5.21	5.42	*
	(0.04)	(0.09)	
Main variables of analysis			
SES	-0.42	-0.37	*
	(0.01)	(0.02)	
OLDS score	25.79	28.49	**
	(0.55)	(0.80)	
Spanish at Home	0.55	0.37	***
	(0.01)	(0.01)	
Took fall - K math test in Spanish	0.34	0.21	***
	(0.01)	(0.01)	
Took spring - K math test in Spanish	0.23	0.14	***
	(0.01)	(0.01)	
Control Variables			
Age at kindergarten entry (month)	64.5	65.2	**
	(0.09)	(0.19)	
Change School	0.28	0.34	*
	(0.01)	(0.02)	
Kindergarten status			
first time	83	74	***
second time	5	4	
status unknown	12	22	

Variables in the Study

Dependent Variable

In order to estimate math score at kindergarten entry, and growth rates during kindergarten, first grade, and from first to third grade, I use math test scores from math assessments and time variables.

Math tests and assessments

The ECLS-K math tests cover the following content areas:

- *Number sense, number properties and operations*: measures understanding of numbers, fractions, decimals and integers; operations and estimations; and their application to real life situations. The test includes understanding of numbers and operations properties, ability to generalize from patterns and verification of results. They also incorporate understanding of percentages, ratios and proportions.
- *Measurement*: includes skills such as measurement units, comparing units to objects, and reporting results. It also includes concepts of time, money, temperature, length, perimeter, areas, mass and weight.
- *Geometry and spatial sense*: measures from identification of shapes to their transformation and combination. It also includes construction of shapes.
- *Data analysis, statistics and probabilities*: incorporates collecting, organizing, reading and representing data skills. Identification of patterns and ability to make

inferences and to draw conclusions from the data are included in this content. Also, it incorporates probability measures and judgments about the likelihood of events occurring.

- *Patterns, algebra and functions*: measures recognition, creation, explanation and generalization of patterns and sequences. It also analyzes students' ability of identifying solutions in equations with one or two missing variables.

These Math tests are curriculum-based assessments based on the National Assessment of Educational Progress (NAEP) framework of content areas and domains. The NAEP framework for math is mainly based on the curriculum standards from the Commission on Standards for School Mathematics of the National Council of Teachers of Mathematics (NCTM 1989). The Math tests aim to measure Math knowledge and skills acquired in school. The tests measure both conceptual and procedural knowledge, as well as problem solving skills.

The same math test is used for math assessments in kindergarten and first grade. A different test is developed for third graders. It is assumed that by third grade, students' knowledge and skills are more advanced than those covered in the Kindergarten and first grade tests. The third grade test also includes some items from the previous tests in order to longitudinally scale the three tests.

Each math test consists of 100 questions measuring those content areas and skills defined earlier. However, each student answered between 35 and 45 items in the kindergarten and first grade test; of which 17 were routing questions and the remainder being the core part of the test. The precise number of questions answered by a student depends on the difficulty level of the test.

The process of assessments is individual, un-timed, and adaptive. A trained individual presents items during the test and inputs children's response into a computer. Each particular assessment consists of two parts: 1) a routing part that identifies children's initial Math knowledge and skill levels, and 2) a core part that contains items with appropriate levels of difficulty. For the core part of the test, students answered questions from one of three distinct levels of difficulty (high, medium, and low).

Assessment application procedures are very similar among math assessments during different waves. However, in the third grade test, 7 or 8 questions that require computations and written responses were added.

The math assessments, as well as other cognitive tests, and their process of application followed a strict procedure of construction and validation. To measure all content areas within each subject, more than 200 items were developed. Items were field tested and reviewed by an expert on content areas; to gather psychometric information to measure reliability and content, construct, and sensitivity validities. Items selected were relevant to measure the content areas previously defined, appropriate to measure particular domains within each content area and did not generate concerns related to minority issues.

Among other issues, concerns related to kindergartners' ability to answer written questions, their disposition to concentrate and answer test questions without moving around, entering responses and scoring process made while the evaluation was developed were analyzed in the field.

Assessment results are provided using five types of test scores: 1) Number-right scores, 2) Item Response Theory (IRT) scale scores, 3) standardized scores (T-scores), 4)

criterion-referenced proficiency-level scores, and 5) proficiency probability scores. For my dissertation, I use IRT scale scores because these scores are the best for comparing students' performance based on overall measures of achievement, and to develop longitudinal research. IRT procedures define a student's position within a continuous ability scale based on the whole group of items, regardless of which particular items were answered by the student. In this way, students' math scores are comparable, regardless of which second part of the math test they answered. The underlying assumption of IRT is that students' response to a particular item depends on their ability and the test properties. The later includes difficulty of the item, its discriminating ability and its "guess-ability."

The difficulty of an item measures the probability of a student whose ability matches the item difficulty answering the item correctly. Item's discriminating ability measures the probability of an item separating students whose ability is lower than the difficulty of the item from students whose ability is higher than the difficulty of the item. The "guess-ability" of an item reflects the probability of a student with very low ability answering the item correctly. IRT scores is the sum of the probabilities of answering all items correctly.

IRT scores also allow vertically scaling, so test scores could be compared across grade levels. After adding items from subsequent waves, a re-scale procedure is needed and estimates of items' characteristics and students' ability tend to be more stable. In the ECLS-K, re-scale scores are available at first grade and in the spring of third grade. The re-scaling process impacts the sample size of this study somewhat, because this process is based on additional information given by third grade test scores, and re-scaling scores are

not available for students that do not have third grade math tests; consequently, I have to drop those students that do not have third grade re-scale scores.

Particularly challenging is the vertically scaled scores between the spring of first and third grade, because the ability level of the items between these grades only overlapped in the tail of the ability distribution. Few students answered very difficult items in first grade while for most students in third grade these items were very easy. To accurately estimate cognitive gains between first and third grade and to correctly define items' reliability into the difficulty scale, math assessment is tested on an intentional sample of 900 students from 43 schools. For a detailed explanation of this "bridging" procedure, review Chapter 3 of "User's Manual for the ECLS-K Third Grade Restricted-Use Data File and Electronic Codebook."

Time variables

Time variables are measures in months for 4 periods of time: kindergarten, during the summer, first grade, and between first and third grade. Time variables are continuous variables indicating the number of months students spend in school during each time period. I compute time variables following Reardon's (2003) strategy for constructing time variables. These variables are computed based on assessment dates and on principals' information about starting and ending school dates for kindergarten, first grade, and third grade. If the relevant information was not available from principals, the following imputation decisions were made. For any given school in a particular grade, if the information was not available, starting and ending dates for the same school gathered in any other grade was used. Second, if dates were still missing, information from

parents' questionnaire was used. Finally, if dates were still missing, dates were imputed by averaging state mean for private and public schools.

To create the time variables, Reardon (2003) followed the subsequent logic. For waves 1 and 2 students, time during kindergarten is computed by subtracting dates of starting kindergarten from kindergarten assessment dates. For these students, time during the summer, during the first grade, and between the first and third grade is equal to zero. For waves 3, 4, and 5 students, the time during kindergarten is computed by subtracting dates of ending from dates of staring kindergarten. For these students, time during the summer is estimated by subtracting the dates of starting first grade from the dates of ending kindergarten. Time during the first grade is computed by subtracting first grade assessment dates from dates of staring first grade. For students in waves 3 and 4, time between first and third grade is equal to zero, while for students in wave 5, it is estimated by subtracting dates of ending first grade from third grade assessment dates. All time variables are divided by 30.5; the average number of days within a month.

Growth rates are adjusted by the time of instruction that each student received. The time between first and third grade is defined somewhat differently than the other time variables. Because data were not collected in the fall of third grade, there is no information to estimate growth rate during this grade. Because learning occurred between first grade and the beginning of third grade, the last segment of time was defined as time between first and third grade.

Main Variables of Analysis

Students' race/ethnicity

Students are classified as non-Hispanic Whites, non-Hispanic Blacks, or Hispanic of any race. This variable is constructed based on ECLS-K "race" composite variables. Students' race/ethnicity is redefined based on information of country of birth and membership in a Hispanic group. Students are redefined as Latinos if they or their parents were born in Mexico, Cuba, Puerto Rico, or in any Spanish speaking country in South America or Central America as reported by students' parents. In addition, students are considered Hispanics if they belong to a Hispanic group regardless of race. Contradictory information was resolved based on the following: if a student was considered Hispanic by their parents at any point of time, he/she is defined as a Hispanic student. By redefining this race/ethnicity variable, the Hispanic sample increased by 5%; from 3,815 to 4,006 students. It is not likely that this change altered the estimations of this study. Missing kindergarten race information is replaced with first or third grade data. The final math sample size includes 66% native Whites, 14% native Blacks, and 20% Latinos of any race.

Hispanic students' country of origin

This variable is constructed based on children and their parents' place of birth, or based on parents' reports of students belonging to a particular Hispanic group. Hispanic children are classified either as having Mexican, Puerto Rican, Cuban, South American, Central American, or other Hispanic origins. South American origin students only

include those from Spanish-speaking countries. Brazil, French Guiana, Guyana and Suriname are excluded from this category. In the same way, Central American origin students only included those from Spanish-speaking countries in that region along with Dominican Republic. Most Caribbean islands are not included in the Central American group.[4] "Other Hispanic" origin includes those students whose parents defined them as Hispanics regardless of place of birth. This category clusters a heterogeneous group of students that could have their ancestries in Brazil, Guyana, Dominica, among other places; or whose parents defined them as members of other Spanish/Hispanic and Latino groups other than Mexicans, Puerto Ricans, or Cubans. This research focuses mainly on all Latino groups excluding students of "*Other Spanish culture or origin*" because this group is not well defined in terms of country of origin and usually includes individuals from various geographical areas with extremely diverse characteristics.

Information about children's countries of origin is obtained from kindergarten and first grade parents' questionnaires, while parents' countries of birth are obtained from first and third grade parents' questionnaires. In kindergarten and first grade, the questions about country of origin referred to the questionnaire respondent's place of birth rather than parents' place of birth. In third grade, country of birth question is asked for all family members if the information was missing in the first grade data collection.[5] Missing country of birth information is replaced with Hispanic origin question. When contradictory information arises (e.g. children born in Mexico but members of a Cuban group), I prioritize reporting children or parents' country of origin rather than Hispanic

[4] Aruba, Bahamas, Barbados Belize, Bermuda, Dominica, Haiti, Jamaica, St. Kitts and Nevis, St. Vicente and the Grenadines, Trinidad and Tobago, Virgin Islands and Antigua and Barbuda, Cayman Islands, Grenada, Guadalupe, Martinique, St. Lucia were also excluded form the Central American sample.
[5] E-mail communication with Elvira Hausken dated 14 Sept, 2004

group membership. Cases still with missing information about country of origin are deleted from the sample.

Among Hispanics, Mexican students account for 65%. The remaining percentage is composed of 5.60 % South Americans, 10.17% Central Americans, 8.79% Puerto Ricans, 3.53 % Cubans, and 6.81% other Hispanics. The unweighted percentages reflect national estimations of the total Hispanic population; Mexicans account for 66% of Hispanics (U.S. Census, 2000).

Hispanic students' generational status

Students are classified either as first, second, or third^{+} generation depending on where they and one of their parents were born. Because the definition of generational status is mainly based on one parent's information, there could be some misclassification problems for this variable. First generation students are non-U.S born from non-U.S born parents. Second generation students are U.S born from non-U.S born parents. Third^{+} generation students are U.S. born students with U.S. born parents. For students with missing information, I make the following decisions: if students' place of birth is missing and parents are foreign-born parents living in the U.S less than 6 years, these students are defined as first generation. If students' place of birth is missing and parents are foreign-born parents living in the U.S for more than 6 years, these students are defined as second generation. If students' country of birth is missing and parents are U.S. born, these students are defined as third^{+} generation.

Hispanic students in the kindergarten class of 98-99 are more likely to have foreign-born parents than U.S born parents. 71.8% of Hispanic kindergarteners are either

first or second generation students. The 2000 Census estimated that around 68% of the entire U.S. Hispanic population has foreign-born parents.

The distribution of generational status varies by Latino country of origin. Cuban, and particularly, South American students are more likely to be first generation than students from the remaining Hispanic groups. Mexican and Cuban students are more likely to be second generation than Puerto Rican and Other Hispanic students. The later Latino groups are more likely to have U.S. born parents than the former (See Table 4.1 on page 72).

The ECLS-K data does not allow for identifying South and Central American third^{+} generation students. The question used to identify this variable only allowed for choosing as Hispanic origin: Mexican, Cuban, Puerto Rican, and Others. Consequently, South and Central American origins students are likely to be included among Other Hispanics third^{+} generations students.

Students' SES

This index is a standardized measure with mean of 0 and standard deviation of 1 in the total ECLS-K sample. It represents student families' socioeconomic status based on mothers' and fathers' education, mothers' and fathers' occupation and household income, measured in the fall of kindergarten and in the spring of first grade. This variable is constructed based on the "SES" composite variables provided by NCES. When data is available for both grades, they are averaged. Missing first grade information is replaced with kindergarten information. In 0.46% of the sample where

"SES" is missing, it is replaced by the mean (i.e. 0). A dummy "SES missing" variable is created.

Hispanic students' language used at home

This is a dummy variable that indicates the primary language used at home. Students could live in English-only homes or in homes where Spanish is the primary language used. This variable is obtained from students' school records. If the information is not available through this source, the ECLS-K gathered the information from teachers' reports. This information is gathered in the first four waves of the study.

Hispanic students' English ability at kindergarten entry

In each wave of the first two grades, students from non-English speaking homes are screened to determine if they have minimum English skills to answer cognitive assessments in English. The ECLS-K study uses the English Oral Language Development Scale (OLDS), a measure of oral English ability, for this purpose. The OLDS scores range between 0 and 60 points with a passing score of 36 points (Rock and Pollack 2002).

All students from non-English speaking homes have to take an English version of the OLDS assessment. If a student passes the OLDS, he would answer the cognitive assessments in English. If a student fails the English version of the OLDS, he/she would answer the Spanish version of the OLDS. If a student passes the Spanish version of the OLDS, she/he would answer the Math assessments in Spanish. If a student fails the Spanish version of the OLDS, she/he would not answer any cognitive assessment. This

procedure was repeated in each wave except in the case of the 5th wave, when students' oral English ability is assumed high enough to answer all assessments in English (National-Center-for-Education-Statistics 2003).

The variable measuring English ability is a standardized measure of students' oral English ability at kindergarten entry based on students' responses to the OLDS. The mean OLDS score for those Hispanic students who took the OLDS is equal to 47.42 points, and its standard deviation is equals to 9.37.

Because OLDS scores are only available for students from non-English speaking homes, I assign a value of zero for the remaining students and add a dummy variable ("Took the OLDS") to the model that is coded "1" if the student took the OLDS test. Also, a value of 0 replace missing OLDS scores (4.48% of Hispanics analyzed). Another dummy variable is created: "OLDS missing."

Control Variables

To avoid any confounding effects, age at kindergarten entry; first time or second time kindergartener, and students' school moving status, are included as control variables. Age at kindergarten entry is measured in months and is centered around 66 months, which is roughly the mean age at the beginning of schooling. "Changed school" is a dummy variable based on school ids for the five waves. In the sample, 25.29% of students changed schools at least one time between kindergarten and third grade, and 95.8% are defined as first time kindergarteners. Table 4.3 presents the summary statistics of all the variables used in this study for the entire analytical sample.

Table 5.3

Variables Summary Statistics for the Analytical Sample

Variables	M	SD	N
Dependent Variables			
Math scores (third grade re-scale scores)			
Wave 1	21.93	8.97	10486
Wave 2	32.08	11.53	11363
Wave 3	38.85	13.52	3689
Wave 4	55.52	16.01	11129
Wave 5	85.11	17.68	10907
Time variables (months)			
During kindergarten (time until test)	7.49	.85	11623
During the summer (time until test)	1.35	.39	11623
During first grade (time until test)	4.18	1.09	11623
From first to third grades (time until test)	5.15	1.82	11623
Main variables of analysis			
SES	0.02	0.77	11570
Hispanic students' English ability (standardized)	-0.03	.74	2217
Hispanic students' home language is non-English	.55	.50	2217
Control Variables			
Age at kindergarten entry	-.65	4.38	11623
Kindergarten status			
first time	.85	.36	
second time kindergartener	.04	.19	11623
status unknown	.12	.32	
School moving status	.75	.44	11623
Recoded 1 = ever move schools between k-3rd			

Note: M = mean; SD = standard deviation; N = number of cases

For detailed description of all variables in this section, see Chapter 7 of the "User's Manual for the ECLS-K Third Grade Restricted-Use Data File and Electronic Codebook" (National-Center-for-Education-Statistics 2003). See Appendix # A, Table A1 for the ECLS-K variables naming conventions.

Methods

In this study, I take a longitudinal perspective or growth approach to analyze math educational outcomes. Thereby, circumventing one of the main critiques of school achievement research; the fact that past research has mainly focused on a single point in time and therefore has been unable to measure learning growth.

Following Reardon (2003), and Downey and collaborator's (2005) methodological approach, math learning trajectories are modeled using a "piecewise" linear growth. Piecewise Linear Growth Models estimate learning growth as a function of time. Students' learning trajectories depend on learning occurring before kindergarten entry, during kindergarten, in the K-1 summer, during first grade and between first and third grade. Each period or "piece" has its own linear learning growth rate. Thus, math trajectory is estimated as a combination of an initial score at kindergarten entry and four growth rates. The math score at kindergarten entry is measured based on the estimated average IRT score when students arrive to school. Growth rates are assumed to be equal and linear within each period. Using this piecewise model improves learning rates estimates compared to simple change scores, because it takes into account that students were assessed at different times and their schools have different length years (Reardon, 2003).

Math learning rates are estimated using Hierarchical Linear Models (HLM). I use a two-level model – assessments as the first level unit, and students as the second level unit. By using a two-level model, I avoid obtaining biased estimators of observed

groups' differences due to the relations between school level random effects and students' race/ethnicity. If I use a three-level HLM model, some of the groups' differences would have been accounted by their schools differences. Because I was not taking into account the clustering nature of students within schools, the estimated coefficients analyzed come from models with fixed effects estimations with robust standard errors.

Using HLM has significant advantages over regular Ordinary Least Squares Regression (OLS) because HLM estimates parameters without necessarily having all test scores for each student. Further, it gives valid and accurate estimates when dealing with nested data as in this case, where assessments are nested within students; because it takes into account the complex structure of the error term (Raudenbush & Bryk, 2002). With nested data, (OLS) tend to overestimate significant levels because the independence assumption is violated. Individuals within social contexts – such as schools, tend to be more alike than if the sample was randomly selected.

Within-Student Equation

The within-person equation allows us to disentangle test scores as a function of initial status at kindergarten entry and four growth rates. The level 1 equation can be represented as follows:

$$Y_{ij} = \pi_{0j} + \pi_{1j}(\text{Kinder}) + \pi_{2j}(\text{Summer}) + \pi_{3j}(1^{st}\text{ grade}) + \pi_{4j}(1^{st} - 3^{rd}\text{ grades}) + e_{ij}, \quad (1)$$

where Y_{ij} is the overall IRT math score, π_{0j} is the estimated initial math score at kindergarten entry and π_{1j}, π_{2j}, π_{3j} and π_{4j} are the four growth rates for each period of time. The error term e_{ij} is assumed to be normally distributed and independent.

Also, where "Kinder" represents the time during kindergarten, "Summer" represents the time between the end of kindergarten and beginning of first grade; "1st grade" represents the time during first grade; and "$1^{st} - 3^{rd}$ grades" represents the time between first grade and the end of third grade.

Between-Student Equation

The second HLM level representing the between-person equation includes student characteristics. It allows us to estimate differences in math scores at kindergarten entry, and differences in growth rates among racial/ethnic groups. The level 2 equation can be represented as:

$$\pi_{0j} = \beta_{00} + \beta_{01}MX + \beta_{02}PR + \beta_{03}CB + \beta_{04}\,SA + \beta_{05}CA + \beta_{06}\,Other + \beta_{07}\,Blk + r_{00} \quad (2a)$$

$$\pi_{1j} = \beta_{10} + \beta_{11}MX + \beta_{12}PR + \beta_{13}CB + \beta_{14}\,SA + \beta_{15}CA + \beta_{16}\,Other + \beta_{27}\,Blk + r_{10} \quad (2b)$$

$$\pi_{2j} = \beta_{20} + \beta_{21}MX + \beta_{22}PR + \beta_{23}CB + \beta_{24}\,SA + \beta_{25}CA + \beta_{26}\,Other + \beta_{27}\,Blk + r_{20} \quad (2c)$$

$$\pi_{3j} = \beta_{30} + \beta_{31}MX + \beta_{32}PR + \beta_{33}CB + \beta_{34}\,SA + \beta_{35}CA + \beta_{36}\,Other + \beta_{37}\,Blk + r_{30} \quad (2d)$$

$$\pi_{4j} = \beta_{40} + \beta_{41}MX + \beta_{42}PR + \beta_{43}CB + \beta_{44}\,SA + \beta_{45}CA + \beta_{46}\,Other + \beta_{47}\,Blk + r_{40} \quad (2e)$$

where β_{01}-β_{47} represent the differences in initial statuses and growth rates between students with Mexican (MX), Puerto Rican (PR), Cuban (CB), South American (SA), Central American (CA), Other Hispanics (Other) and Black (Blk) students; and the reference category (Whites).

Equations 1 and 2a-2e are base line equations, to which I add other student levels variables, such as generational status, English ability at kindergarten entry, and SES. Equations 2a to 2e reflect the effect of students' characteristics on math scores at kindergarten entry and growth rates. For instance, after incorporating English ability or SES in the model, I am able to analyze how math learning trajectories between

kindergarten and third grade are shaped by including these variables in the models. For each of the estimated growth rates, I include second time kindergartener, kindergarten status unknown and students' school moving status as control variables.

Because the HLM equation has five random effects at level two to be estimated (i.e. r_{00}, r_{10}, r_{20}, r_{30}, r_{40} and r_{50} at the between student equation), and there are at the most five observations per children, I need to fix the level 1 variance (e_{ij}). Therefore, I use precision weights computed based on the following formula:

$$W_t = 1 / [(1 - \alpha_t) \sigma_t^2],$$

where α_t is the estimated test reliability at wave "t" and σ_t^2 is the unconditional test variance at wave "t" (Reardon, 2003).

In this research, I estimate seven statistical models. Model one includes only race/ethnicity variables at level two for level-one slopes and intercepts (i.e. equations 2a – 2e in page 108). In Model two, I add generational status variables (i.e. first, second, and third$^+$ generations). Model three includes race/ethnicity and Hispanic country of origin variables at level two for level-one slopes and intercepts. This model estimates raw differences in math test scores at kindergarten entry, as well as differences in growth rates during the school years among Hispanic students of distinct countries of origins, and between them, and White and Black students. In Model four, Hispanic countries of origin and immigrant generational status interactions are included. Three dummy variables, one, two, and three$^+$ generation, are added for each Hispanic group. This model estimates raw differences in math test scores at kindergarten entry and growth rates between kindergarten and third grade for Hispanic students of different countries of origin and generational status. In model five, I add the Hispanic students' English ability

measured at kindergarten entry variable for level one slopes and intercepts (i.e. equations 2a – 2e in page 108) to analyze the independent effect of students' English ability on Hispanic groups different math score at kindergarten entry and growth rates. This model estimates the independent effect of English ability. It also allows me to analyze how differences among Hispanic groups and between them and White students change after incorporating English ability at kindergarten entry in the model. In model six, I add the SES variable in each of the time periods to analyze the independent effect of students' SES on Hispanic groups different in math achievement. As in the previous model, I analyze how estimated differences change after including the SES measure in the model. Finally, model seven includes variables, students' English ability, and SES. This model allows me to analyze the conditional effect of English ability on math outcomes after controlling for the SES effect. Similarly, it lets me analyze the conditional effect of SES on math outcomes after controlling for English ability. By including both variables in the model, I can identify which variable has a stronger effect in affecting the math gaps.

Estimated differences on math score at kindergarten entry and growth rate gaps are reported based on IRT metric and pooled standard deviation unit. As I mentioned earlier, IRT scores are computed based on number of items responded to correctly, and by taking into account, items' difficulty, its discriminating ability, and it's "guess-ability." Pooled standard deviations tell us how big or small the achievement gaps are relative to the average within-group standard deviation of all groups (i.e. Black, White, and Hispanic students). Gaps measured in pooled standard deviation units are computed as followed:

$$\text{Gap in Pooled Standard Deviation Units} = \beta_{xj} \; / \; \sigma\pi_{xj},$$

where β_{xj} are the estimated coefficient representing the raw gap between Hispanic groups and Whites, and $\sigma^2\pi_{xj}$ is the HLM variance components of model 1.

I use the variance components of model 1, which include only race/ethnicity and Hispanic country of origins variables, to report estimated differences in pooled standard deviation so they can be comparable among those observed in different models.

To estimate groups' differences in initial status and growth rates, I use Multivariate Hypothesis Testing for fixed effects (β_{xj}) of the following null hypothesis:

$$H_0 : {}_{0\text{-}4j} = \beta_{0\text{-}4j} = 0,$$

If the p-value associated with these comparisons are lower than "0.05," it means that there is evidence of differences between groups.

CHAPTER 6

RESULTS

Estimating Hispanic Students' Math Learning Trajectories

This chapter analyzes Hispanic subgroups' math achievement patterns by studying students' math scores at kindergarten entry, and their growth rates between kindergarten and third grade. I also discuss math achievement differences between Hispanic students from different countries of origin and White and Black students. Tables present regression coefficients in IRT scores with standard errors in parentheses; these regression coefficients represent gaps rather than absolute scores. Three significance levels are presented in the tables: ** p-value<=0.01; * p-value<=0.05; + p-value<=0.1. Results presented in this section come from models where age at kindergarten entry, "changed school status," and kindergarten status (i.e. first, second, or unknown) are controlled. Differences in pooled standard deviations units are presented in figures. Confidence intervals of estimated gaps measured in pooled standard deviations are shown in Appendix C, Table C1. Native-born third^{+} generation Non-Hispanic White students are the reference group, represented by the value of "0" on the horizontal axes in figures.

Math Skills at Kindergarten Entry

This section aims at presenting evidence about Hispanic subgroups' math knowledge at kindergarten entry. In particular, this section answers the following research questions: What are the math knowledge differences at kindergarten entry across Latino subgroups? How does Hispanic student subgroups' math knowledge at the beginning of kindergarten and their math growth rates compare to those of White and Black students?

To answer these research questions, I present estimated coefficients from Models 1, 2, 3, and 4. First, I include only race/ethnicity variables in Model 1 to compare initial math score gaps between Hispanic students overall and White and Black students. In Model 2, I add generational status variables (one, second and three^{+} generation) for Hispanic students. Model 3 includes race/ethnicity and Hispanic students' countries of origin; and in Model 4, I add generation status variables for each Hispanic group. All these variables are added at level two's intercept and slopes of the HLM equation. The discussion of this section focuses on estimated coefficients for the intercept (π_{0j}). See the methodology section on pages 106-111. It is important to note that despite their large size in absolute terms, some estimated gaps by generational status do not reveal statistical significance. Remember that cases within each group could be too small to obtain precise estimates. See Table 5.1 in the methodology chapter on page 90.

For comparison, at kindergarten entry, the pooled standard deviation for Black, White and Hispanic students together is 7.5 points. Results of the complete HLM models are reported in Appendix C, Tables C2 and C3.

Hispanic Differences in Math Skills at Kindergarten Entry by Country of Origin

Table 6.1 illustrates that at kindergarten entry, Hispanic students' average math scores are lower than White and Black students' scores. The Hispanic – White initial math score gap is 5.35 points and the Black –White gap is 4.68 points.

Table 6.1

Estimated Math Score Gaps at Kindergarten Entry by Race/Ethnicity

	Model 1	Significant Differences	
		Wht	**Blk**
Intercept	20.69		**
	(0.12)		
Black	-4.68	**	
	(0.2)		
Hispanic	-5.35	**	**
	(0.19)		

Note: ** p-value<=0.01, * p-value<=0.05, + p-value<=0.1; standard errors in parentheses

When I disaggregate Hispanic students by country of origin, even though Hispanic students from any country of origin have significantly lower average math scores than White students, an important variability in gap sizes is observed by Hispanic students' country of origin (see Table 5.2, Model 3). Similarly, after including country of origin variables in the model, only some Hispanic subgroups show lower math scores at the start of kindergarten than Black students.

For instance, Mexican and Central American students have the lowest average math scores. They also have lower average math scores than do Black students. In contrast, although Puerto Rican and Cuban show lower math scores than White students

at kindergarten entry, their average math scores are not significantly different from Black students' average math scores; indicating that Puerto Rican, Cuban and Black students have similar math scores at kindergarten entry.

Moreover, South Americans show the smallest initial math score gap compared to Whites and their average math score is higher than those of Black students.

Table 6.2

Hispanic students' Estimated Math Score Gaps at Kindergarten Entry by Country of Origin

	Model 3	**Significant Differences**	
		Wht	**Blk**
Intercept	20.68		
	(0.12)		
Black	-4.69	**	
	(0.2)		
Mexican	-6.1	**	**
	(0.21)		
Cuban	-3.35	**	
	(0.95)		
Central A.	-6.08	**	**
	(0.44)		
Prto Rican	-4.43	**	
	(0.56)		
South A	-2.46	**	**
	(0.78)		
Other Hsp	-1.64	*	**
	(0.65)		

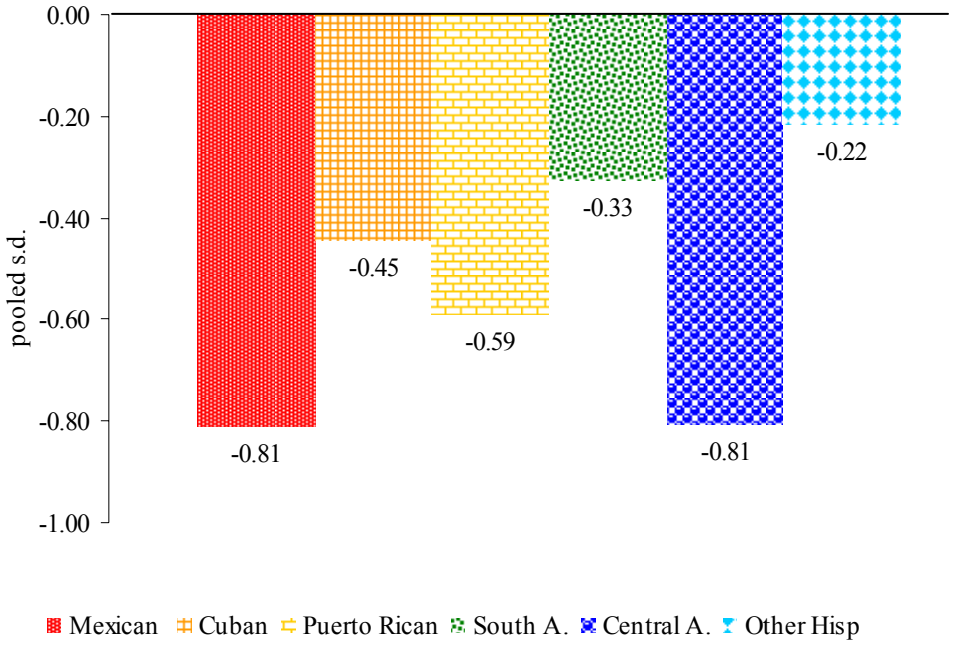
Note: ** p-value<=0.01, * p-value<=0.05, + p-value<=0.1; standard errors in parentheses

Results from Models 3 are used to create Figure 6.1. Figure 6.1 shows prominent math score gaps between White students and Hispanic subgroup students; larger

differences are found for Mexican and Central American students and the smallest gap is observed for South American students.

Figure 6.1

Hispanics' Estimated Math Score Gaps at Kindergarten Entry by Country of Origin



Note: White students reference group at value zero; measured in pooled standard deviations

Hispanic Differences in Math Skills at Kindergarten Entry by Country of Origin and Generational Status

Compared to White students, wider initial math score gaps are found for first and second generation Hispanic students than for third^{+} generation Hispanic students (see Table 6.3, Model 2). In pooled standard deviation units, Hispanic students with foreign-born parents' average math scores at kindergarten entry are around one pooled standard

deviation below White students, and 0.4 pooled standard deviation below Black students. Third+ generation Hispanic students show lower average math score than White students, and higher average math score than Black students.

Table 6.3

Estimated Math Score Gaps at Kindergarten Entry by Race/Ethnicity and Generational Status

	Model 2	Significant Differences	
		Wht	Blk
Intercept	20.69		**
	(0.12)		
Black	-4.69	**	
	(0.2)		
Hispanic Gen 1	-7.66	**	**
	(0.43)		
Hispanic Gen 2	-6.02	**	**
	(0.21)		
Hispanic Gen 3 +	-3.21	**	**
	(0.33)		

Note: ** p-value<=0.01, * p-value<=0.05, + p-value<=0.1; standard errors in parentheses

Similar trends as those found in Table 6.2. Model 2 are also reported in Table 6.3 which presents generational differences within Hispanic students from different countries of origin. Within each Hispanic group, lower math growth rates are observed for first generation students than for second generation students, and for second generation students than for third+ generation students. Additionally, first and second generation students' math growth rates tend to be more alike than the ones observed for third+ generation students. By and large, tendencies of improvement of outcomes by generational status are observed in Table 6.4.

Table 6.4
Hispanic students' Estimated Math Score Gaps at Kindergarten Entry by Country of Origin and Generational Status

	Model 4	Significant Differences	
		Wht	**Blk**
Intercept	20.68		
	(0.12)		
Black	-4.69	**	
	(0.2)		
Mexican Gen 1	-8.32	**	**
	(0.45)		
Mexican Gen 2	-6.99	**	**
	(0.23)		
Mexican Gen 3 +	-3.66	**	*
	(0.38)		
Cuban Gen 1	-6.91	**	
	(1.86)		
Cuban Gen 2	-4.04	**	
	(0.99)		
Cuban Gen 3 +	0.31		+
	(2.64)		
Central A. Gen 1	-5.61	**	
	(1.5)		
Central A. Gen 2	-6.14	**	**
	(0.46)		
Prto Rican Gen 1	-7.03	**	
	(2.56)		
Prto Rican Gen 2	-5.21	**	
	(0.77)		
Prto Rican Gen 3 +	-3.45	**	
	(0.82)		
South A. Gen 1	-7.46	**	*
	(1.35)		
South A. Gen 2	-1.61	+	**
	(0.85)		
Other Hsp Gen 1	-3.91	+	
	(2.06)		
Other Hsp Gen 2	-1.8	+	*
	(1.05)		
Other Hsp Gen 3 +	-1.36		**
	(0.87)		

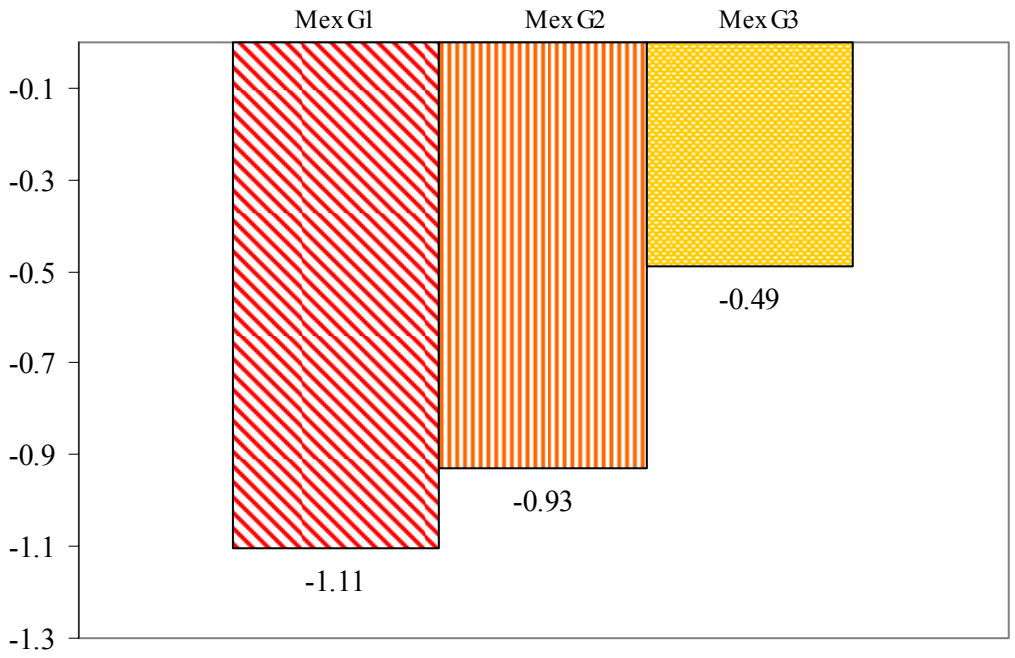
Note: ** p-value<=0.01, * p-value<=0.05, + p-value<=0.1; standard errors in parentheses

Particularly, Mexican students, regardless of generation, have a significantly lower average initial math score than do White students. However, first and second generation Mexican students have lower math scores than Black students, and third^{+} generation Mexican students have higher initial math scores than do Black students (8.32, 6.99, and 3.66 points respectively).

Figure 6.2 shows White and Mexican students of different generations in pooled standard deviation units. First and second generation Mexican students' initial math scores are around 1 pooled standard deviation below White students' scores. The gap between third^{+} generation Mexican and White students is half the gaps observed

Figure 6.2

Mexicans' Estimated Math Score Gaps at Kindergarten Entry by Generational Status



Note: White students reference group at value zero; measured in pooled standard deviations

Results presented in this section suggest that, overall, Hispanic students start school with significantly lower math knowledge and skills than White students, and that considerable variability in math skills at kindergarten entry exist *within* the Hispanic population. Some Hispanic students, such as first and second generation Mexican, and Central American students show lower math scores than do Black students.

Math Growth Rates Between Kindergarten and Third Grade

This section presents evidence of math growth rate gaps between kindergarten and third grade across Hispanic groups. The following research questions are answered in this section: What are the math learning trajectories differences across Hispanic subgroups during the early school years – including kindergarten, first grade, and between first and third grade? How do Hispanic student subgroups' math achievement patterns compare to those of White and Black students?

Coefficients presented here are from growth rate equations in Model 3 and 4. This section analyzes estimated coefficients for kindergarten, first grade and first-third grade slopes (i.e. π_{1j}, π_{3j} and π_{4j}), at the HLM level-two equation. See the methodology section on pages 106-111.

I use similar tables and figures to present results as I did in the previous section. Results are reported in monthly growth rate gaps, allowing each time period (*i.e.* kindergarten, first grade, and from first to third grade) to have a distinct growth rate. As in the previous section, White students are the reference group. A negative coefficient indicates that the math achievement gap increases during a certain time period. In

contrast, a positive coefficient implies that the math achievement gap decreases. For comparison, pooled standard deviations of growth rates during kindergarten, during first grade, and from first to third grade are: 0.88, 1.08, and 0.44 points per month respectively. Results of the complete HLM Models are reported in Appendix C, Tables C2 and C3.

Hispanic Differences in Growth Rates between Kindergarten and Third Grade by Country of Origin

In general, Hispanic students have significantly lower average growth rates than do White students during kindergarten and first grade. As Table 5.5 illustrates, Hispanic – White math growth rate gaps are -0.24 points/month during kindergarten and -0.21 points/month during first grade. During each of these time periods, the math achievement gap between Hispanic and White students increases by approximately 2 points (assuming a 9 months school-year). In contrast, from first to third grade, when Hispanics of different countries of origin and generation are aggregated, no significant differences in average growth rates are observed between them and White students.

Moreover, Table 5.5 indicates that Hispanic students have significantly higher growth rates than do Black students, therefore the Hispanic – White gap is smaller than the Black – White growth rate gap. Hispanic – Black math growth rate gaps are 0.14 points/month during kindergarten, 0.23 points/month during first grade, and 0.15 points/month from first to third grade. These results suggest that the Black – White math achievement gap increases faster than the Hispanic – White gap between kindergarten

and first grade. From first to third grade, only Black students continue to have significantly lower average growth rate than White students.

Table 6.5

Estimated Math Growth Rate Gaps between Kindergarten and Third Grade by Race/Ethnicity

	Model 1	Significant Differences	
		Wht	Blk
During Kindergarten			
Intercept	1.78		**
	(0.01)		
Black	-0.38	**	
	(0.03)		
Hispanics	-0.24	**	**
	(0.02)		
During First Grade			
Intercept	2.55		**
	(0.02)		
Black	-0.44	**	
	(0.05)		
Hispanics	-0.21	**	**
	(0.04)		
From 1st to 3rd Grades			
Intercept	1.21		**
	(0.01)		
Black	-0.15	**	
	(0.01)		
Hispanics	0		**
	(0.01)		

Note: ** p-value<=0.01, * p-value<=0.05, + p-value<=0.1; standard errors in parentheses

When I analyze Hispanic students' growth rates taking in consideration their country of origin, I find significant differences in growth rates across Hispanic groups and time periods.

Table 5.6 shows that only Mexican, Central American, and Puerto Rican students have lower growth rates than do White students during kindergarten. With growth rates 0.28 points/month, 0.28 points/month, and 0.34 points/month lower than White students, the math achievement gaps between these Latino students and White students widen during kindergarten. In contrast, Cuban students show a higher average growth rate than White students, which suggest that Cuban students' math achievement reaches parity with White students by the end of kindergarten. Remember that Cuban students' initial average math score are 3.5 point lower than White students' average math score, but by the end of kindergarten, Cuban and White students have similar math skills on average.

Further, Mexican, South American, and Cuban students have higher growth rates than Black students during kindergarten. Compared to Black students, Cuban, South American and Mexican students' average growth rate gaps are 0.71 points/month, 0.26 points/month, and 0.10 points/month respectively.

In sum, compared to White students, Central American, Puerto Rican and Black students' math achievement gaps widens at a faster pace than the Mexican – White students math achievement gap during kindergarten. The South American – White students' math achievement gap neither widens nor reduces, and the Cuban – White students math achievement gap becomes inexistent.

Table 6.6

Hispanic students' Estimated Math Growth Rate Gaps during Kindergarten by Country of Origin

	Model 3	Significant Differences	
		Wht	Blk
Intercept	1.78		**
	(0.01)		
Black	-0.38	**	
	(0.03)		
Mexican	-0.28	**	**
	(0.03)		
Cuban	0.33	**	**
	(0.11)		
Prto Rican	-0.34	**	
	(0.06)		
South A	-0.12		**
	(0.09)		
Central A.	-0.28		
	(0.07)	**	
Other Hsp	-0.07		**
	(0.08)		

Note: ** p-value<=0.01, * p-value<=0.05, + p-value<=0.1; standard errors in parentheses

During first grade, as in kindergarten, Mexican, Central American, and Puerto Rican students have lower growth rates than do White students. The Mexican – White, Puerto Rican –White, and Central American – White growth rate gaps are: 0.17, 0.28, and 0.29 points/month respectively. Math achievement gaps between White and these Latino students continue to widen during first grade

Compared to White students, Mexican and Puerto Rican students have lower growth rates than during kindergarten, suggesting that these students' math achievement

gaps widens at a slower pace during first grade than during kindergarten. In contrast, Central American students show similar growth rates during kindergarten and first grade.

Additionally, only Mexican and South American students show significant lower growth rates than do Black students during first grade. The remaining Hispanic subgroups have growth rates not significantly different than those of Black students; in some cases because standard errors associated to their growth rate are very large.

In sum, compared to White students, Central American and Puerto Rican students' math achievement gaps widens at a faster pace than the Mexican – White students math achievement gap during first grade, which also widens during this time period. The South American – White and the Cuban – White students' math achievement gaps remain stable during first grade.

Table 6.7

Hispanic students' Estimated Math Growth Rate Gaps during First Grade by Country of Origin

	Model 3	Significant Differences	
		Wht	Blk
During first grade			
Intercept	2.55		**
	(0.02)		
Black	-0.44	**	
	(0.05)		
Mexican	-0.17	**	**
	(0.03)		
Cuban	-0.25		
	(0.18)		
Prto Rican	-0.28	*	*
	(0.12)		
South A	-0.08		*
	(0.17)		
Central A.	-0.29	*	
	(0.14)		
Other Hsp	-0.48	*	
	(0.14)		

Note 1: ** p-value<=0.01, * p-value<=0.05, + p-value<=0.1; standard errors in parentheses

From first to third grade, Hispanic students from different countries of origin have higher growth rates than do White students; Mexican and South American students being the only exception. Table 5.8 indicates that Mexican, Puerto Rican, Cuban, and Central American students have significantly different math growth rates than White students. Mexican students' average growth rate is -0.05 points/month while Puerto Rican, Cuban, and Central American students' growth rates are 0.09, 0.1, and 0.09 points/month respectively. These results denote that between first and third grade the Mexican –White

students' math achievement gap widens, the South American – White students math gap remains the same, the Puerto Rican – White, Cuban – White, and Central – White students' math achievement gap narrow.

Moreover, Hispanic students from different countries of origin show higher growth rates than do Black students. These results suggest that while the math achievement gaps narrow between White students and Central American, Cuban, and Puerto Rican students, the Black – White students gap widens from first to third grade.

Table 6.8

Hispanics' Estimated Math Growth Rate Gaps from First to Third Grade by Country of Origin

	Model 3	Significant Differences	
		Wht	Blk
Intercept	1.212		**
	(0.01)		
Black	-0.15	**	
	(0.01)		
Mexican	-0.05	**	**
	(0.02)		
Cuban	0.1	+	**
	(0.06)		
Prto Rican	0.09	*	*
	(0.04)		
South A	0.06		
	(0.05)		
Central A.	0.09	*	**
	(0.04)		
Other Hsp	0.06		
	(0.04)		

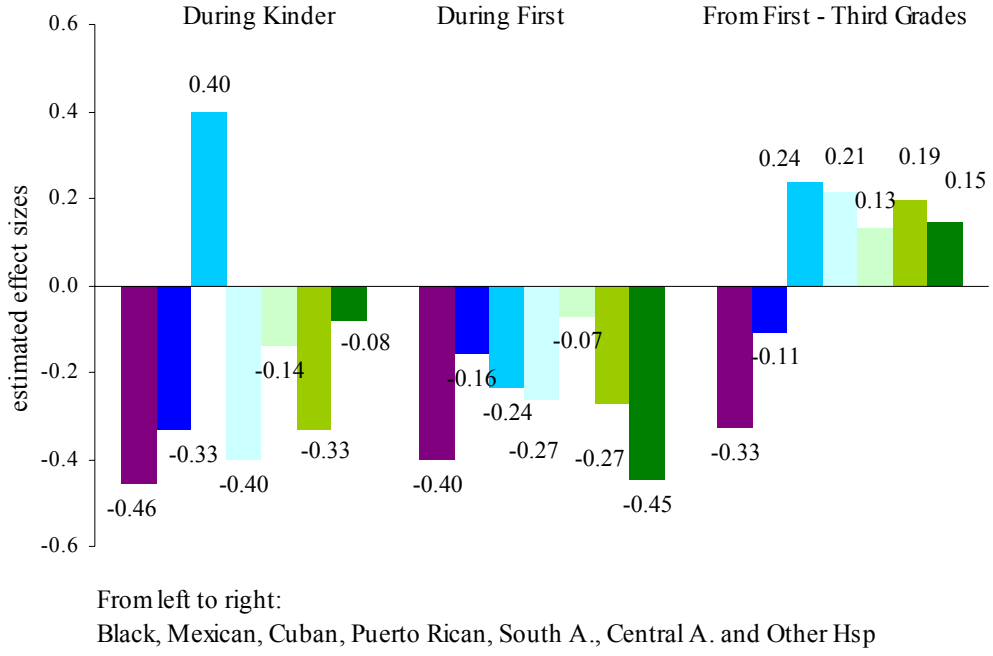
Note: ** p-value<=0.01, * p-value<=0.05, + p-value<=0.1; standard errors in parentheses

In addition to analyzing whether math knowledge gap narrows or widens over time, it is important to study the size of the gap. The size of growth rate gaps is only discussed for those Hispanic groups having significantly different growth rates than White students.

In general, Latino – White students' growth rate gaps measured in effect sizes are large. For instance, during kindergarten, growth rate gaps are between half and one third pooled standard deviations; during first grade growth rate gaps are close to one fourth pooled standard deviations, and from first to third grade gaps are close to one fifth. Additionally, the Latino – White students' growth rate gaps decrease over time. As shown in Figure 6.2, bigger growth rate gaps are observed during kindergarten than during first grade. Similar patterns are found when comparing growth rate gaps during first grade and from first to third grade. Compared to White students, during kindergarten, Cuban, and Puerto Rican students have the largest gaps and Central American students show the smallest growth rate gap. During first grade, Cuban, Puerto Rican and Central American students' growth rate gaps are between 0.27 and 0.24 pooled standard deviations. From first to third grade, Cuban, Puerto Rican, and Central American students show positive growth rates close to 0.20 pooled standard deviation units.

Figure 6.3

Hispanic Students' Estimated Growth Rate Gaps from Kindergarten to Third Grade



Note: White students reference group; measured in pooled standard deviations

Hispanic Differences in Growth Rates between Kindergarten and Third by Country of Origin and Generational Status

During kindergarten, Table 6.9 indicates that Hispanic students from any generation have lower growth rates than do White students and that larger gaps are observed for first and second generations than for third^{+} generation. During first grade, only first and second generation Hispanic students have similar growth rates and both growth rates are significantly lower than the one observed for White students. From first to third grade, growth rate gaps between White students and Hispanic students from any generation are statistically non significant. Thus, these results suggest that math

achievement gaps increases between White and Hispanic students of any generation during kindergarten, continue to increase during first grade only for first and second generation Hispanic students, and remain stable from first to third grade regardless of Hispanic students' generational status.

Table 6.9

Estimated Math Growth Rate Gaps between Kindergarten and Third Grade by Race/Ethnicity and Generational Status

	Model 1	Model 2	Significant Differences	
			Wht	Blk
During Kindergarten				
Intercept	1.78	1.78		**
	(0.01)	(0.01)		
Black	-0.38	-0.38	**	
	(0.03)	(0.03)		
Hispanics	-0.24		**	**
	(0.02)			
Gen 1		-0.34	**	
		(0.08)		
Gen 2		-0.28	**	*
		(0.03)		
Gen 3 +		-0.09	*	**
		(0.04)		
During First Grade				
Intercept	2.55	2.55		**
	(0.02)	(0.02)		
Black	-0.44	-0.44	**	
	(0.05)	(0.05)		
Hispanics	-0.21		**	**
	(0.04)			
Gen 1		-0.26	+	
		(0.14)		
Gen 2		-0.25	**	*
		(0.05)		
Gen 3 +		-0.10		**
		(0.07)		

continue

	Model 1	Model 2	Significant Differences	
			Wht	Blk
From 1st to 3rd Grades				
Intercept	1.21	1.21		**
	(0.01)	(0.01)		
Black	-0.15	-0.15	**	
	(0.01)	(0.01)		
Hispanics	0			**
	(0.01)			
Gen 1		0.05		**
		(0.04)		
Gen 2		-0.01		**
		(0.02)		
Gen 3 +		0.00		**
		(0.03)		

Note 1: ** p-value<=0.01, * p-value<=0.05, + p-value<=0.1; standard errors in parentheses

In Tables 6.10, I disaggregate Hispanic students by country of origin and generational status, showing Hispanic subgroup – White students' growth rate gaps during kindergarten, first grade, and from first to third grade. Recall that because of sample size limitations, I only analyze those cells with enough sample size. Table 6.10 shows that first and second generation Mexican students have lower growth rates than do White and Black students, and third^{+} generation Mexican students' average growth rate is not significantly different than the one observed for White students. The White – Mexican kindergarten growth rate gaps are 0.41, 0.37, and 0.05 points/month for first, second and third^{+} generation. In contrast, for Puerto Rican students, no significant differences in growth rates are observed for second and third^{+} generation students (see Model 4).

Table 6.10
Hispanic students' Estimated Growth Rate Gaps between Kindergarten and Third Grade by Country of Origin and Generational Status

	Model 4	Significant Differences			Model 4	Significant Differences			Model 4	Significant Differences	
		Wht	Blk			Wht	Blk			Wht	Blk
During Kindergarten				*During First grade*				*From First to Third grades*			
Intercept	1.78		**	Intercept	2.55		**	Intercept	1.21		**
	(0.01)				(0.02)				(0.01)		
Black	-0.38	**		Black	-0.44	**		Black	-0.15	**	
	(0.03)				(0.05)				(0.01)		
Mexican Gen 1	-0.41	**		Mexican Gen 1	-0.31	+		Mexican Gen 1	-0.04		*
	(0.09)				(0.17)				(0.05)		
Mexican Gen 2	-0.37	**		Mexican Gen 2	-0.2	**	**	Mexican Gen 2	-0.05	**	**
	(0.04)				(0.05)				(0.02)		
Mexican Gen 3 +	-0.05		**	Mexican Gen 3 +	-0.06		**	Mexican Gen 3 +	-0.04		**
	(0.05)				(0.08)				(0.03)		
Cuban Gen 1	0.3		*	Cuban Gen 1	-0.33			Cuban Gen 1	0.54	**	**
	(0.27)				(0.34)				(0.20)		
Cuban Gen 2	0.4	**	**	Cuban Gen 2	-0.49	*		Cuban Gen 2	0.06		**
	(0.11)				(0.21)				(0.06)		
Cuban Gen 3 +	0.14		+	Cuban Gen 3 +	0.5		**	Cuban Gen 3 +	0.04		*
	(0.31)				(0.56)				(0.08)		
Central A. Gen 1	-0.38	*		Central A. Gen 1	0.6		*	Central A. Gen 1	-0.02		
	(0.07)				(0.50)				(0.10)		
Central A. Gen 2	-0.27	**		Central A. Gen 2	-0.39	**		Central A. Gen 2	0.09	**	**
	(0.61)				(0.14)				(0.04)		
Prto Rican Gen 1	-0.77	**		Prto Rican Gen 1	-0.78	*		Prto Rican Gen 1	0.27	*	**
	(0.26)				(0.36)				(0.11)		
Puerto Rican Gen 2	-0.29	**		Puerto Rican Gen 2	-0.22			Puerto Rican Gen 2	0		**
	(0.10)				(0.17)				(0.05)		
Puerto Rican Gen 3 +	-0.32	**		Puerto Rican Gen 3 +	-0.28		**	Puerto Rican Gen 3 +	0.16	**	**
	(0.08)				(0.18)				(0.06)		
South A. Gen 1	0.12		*	South A. Gen 1	-0.95	*		South A. Gen 1	0.2		**
	(0.20)				(0.41)						
South A. Gen 2	-0.15		*	South A. Gen 2	0.01		*	South A. Gen 2	0.03		**

Note 1: ** p-value<=0.01, * p-value<=0.05, + p-value<=0.1; standard errors in parentheses

When only second generation Hispanic students are analyzed, similar patterns than those observed by country of origin are observed. Second generation Mexican, Puerto Rican, and Central American students have lower growth rates than do White students, and second generation Cuban have higher growth rates than the same reference group.

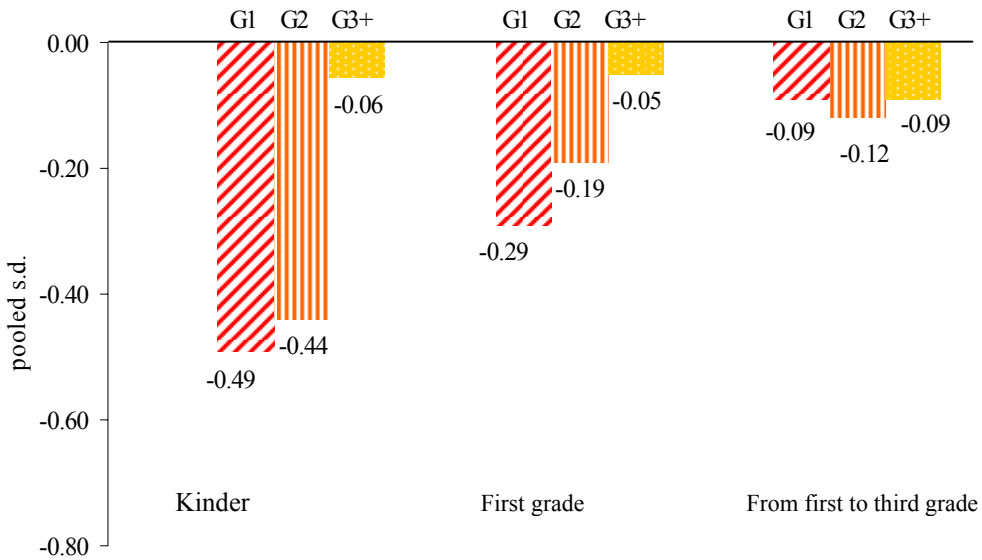
During first grade, Table 6.10 shows lower growth rate gaps for third^{+} generation Mexican than their first and second generation counterparts, compared to White students. When only second generation Hispanic students are analyzed, second generation Mexican, Central American and Cuban have significantly lower growth rates than do White students. Second generation Puerto Rican have similar first grade math growth rates than do White students. Thus, during first grade, the math achievement gap between second generation Puerto Rican and White students remains stable and the math achievement gaps between White students and second generation Mexican, Central American and Cuban student widen.

From first to third grade, Table 6.10 indicates that Mexican students, regardless of generational status, have similar growth rates and lower than the average growth rates observed for White students. During this time period, the math achievement gaps between White and Mexican students of any generation widen. Among second generation Hispanic students, only second generation Central American students have higher growth rate than do White students.

Compared to White students, Figure 6.4 show that during Kindergarten, first and second generation Mexican students have wider gaps than third^{+} generation Mexican students. The math achievement gaps between White and first and second generation Mexican students widen at a fast rate. As in the case of Black students, first and second generation Mexican students have growth rate gaps that are close to one a half pooled standard deviation. Mexican students' growth rate gaps decrease over time at a faster pace than Black students' growth rate gaps.

Figure 6.4

Mexican Students' Estimated Growth Rate Gaps from Kindergarten to Third Grade by Generational Status



Note: White students reference group; measured in pooled standard deviations

Hispanic Students' Math Learning Trajectories between Kindergarten and Third Grade

By Country of Origin

In this section, I shall discuss Hispanic students' math learning trajectories from kindergarten to third grade. Figure 6.4 presents projected Hispanic and Black students' math learning trajectories, measured in IRT scores, over a 36 month period based on estimated initial math score and growth rates reported in Tables 2 to 5, Models 3. Figure 6.5 presents projected math learning trajectories for Mexican students by generational status; this is the only case with a sizable sample size by generational status (see Table 4.1 in p. 75). In figure 6.6, I show math learning trajectories only for second generation Hispanic students. These figures are based on estimated coefficients reported in tables 2 to 5, Models 4. White students, as the reference group, are represented by 0 on the "Y axis." Each group has their own math trajectories representing the estimated gap between them and Whites.

Figure 6.5 suggests that Hispanic students' math learning trajectories could be clustered into two different groups. The first group, Mexican, Puerto Rican, and Central American students, has stronger math disadvantages compared to White students. These students show lower math scores at kindergarten entry and lower growth rates at least during kindergarten and first grade. The second group, Cubans and South Americans, shows smaller or statistically insignificant differences in comparison to White students.

In addition, Mexican students' math achievement gap widens as they move to higher school grades. By the end of third grade, Mexican origin students' average math scores are 11.2 points lower than White students' scores. With an initial gap of

approximately 6 points at kindergarten entry, the White – Mexican students' gap doubled between kindergarten and third grade. Moreover, Mexican students' learning trajectories show math achievement disadvantages when comparing them with other Hispanic students. Mexican students have the lowest math scores at start of kindergarten and they are the only ones with negative growth rates from first to third grade.

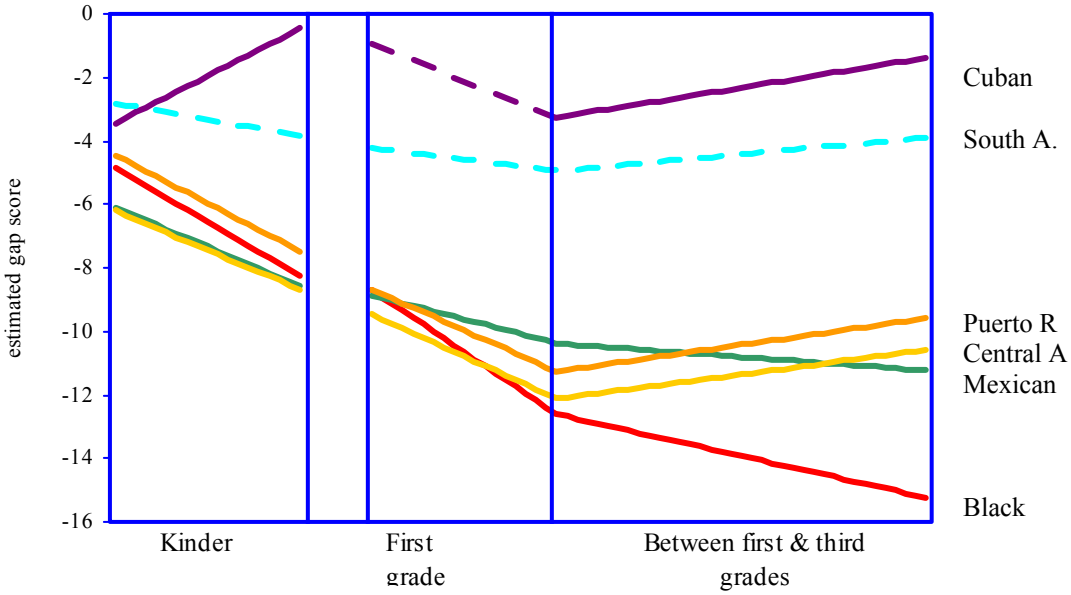
Overall, the Puerto Rican –White students math achievement gap increases during kindergarten and first grade, but it reduces from first to third grade. However, the achievement gap decreases at a smaller pace than it grew during the earlier periods.

Central American students score 6.2 points lower than Whites at kindergarten entry. The Central American – White students math achievement gap widens during kindergarten and first grade but narrows from first to third grade. Although during the later period, the math achievement gap reduces at a slower pace than it grew from kindergarten to first grade. South American students' math learning trajectories are not significantly different from White students,' except for their lower math score at kindergarten entry.

Cuban students' math learning trajectories show a more erratic pattern. On average, Cuban students begin kindergarten with 3.4 points lower than do White students. However, during kindergarten, their math growth rate is positive and larger than White students' growth rate, making the math achievement gap between Cuban and White students non-existent by the end of kindergarten. The first grade growth rate gap between Cuban and White students is insignificant. From first to third grade, Cuban students' average growth rate is significant, reducing the Cuban – White students math achievement gap to 1.38 points.

Figure 6.5

Hispanic Students' Estimated Math Learning Trajectories Gaps by Country of Origin



Note: White students reference group; measured in IRT scores; dashes mean that the growth rate gap is not significant

By Country of Origin and Generational Status

Figure 6.6 illustrates math learning trajectories for second generation Hispanic students. Overall, second generation Hispanic students start kindergarten with significantly lower math test scores than do White students. Initial math test score gaps are pronounced for Hispanic students of different countries of origin except for South American students. The White – second generation South American students' initial math score gap is about 1.6 points. Between kindergarten and third grade, second generation South American students have similar growth rates than do White students; showing similar math learning trajectories as White students.

Second generation Puerto Rican students have different growth rates than White students during kindergarten, and similar math growth rates as White students from the beginning of first to third grade; suggesting that the second generation Puerto Rican - White students math achievement gap widens during kindergarten, and remains stable between first and third grade.

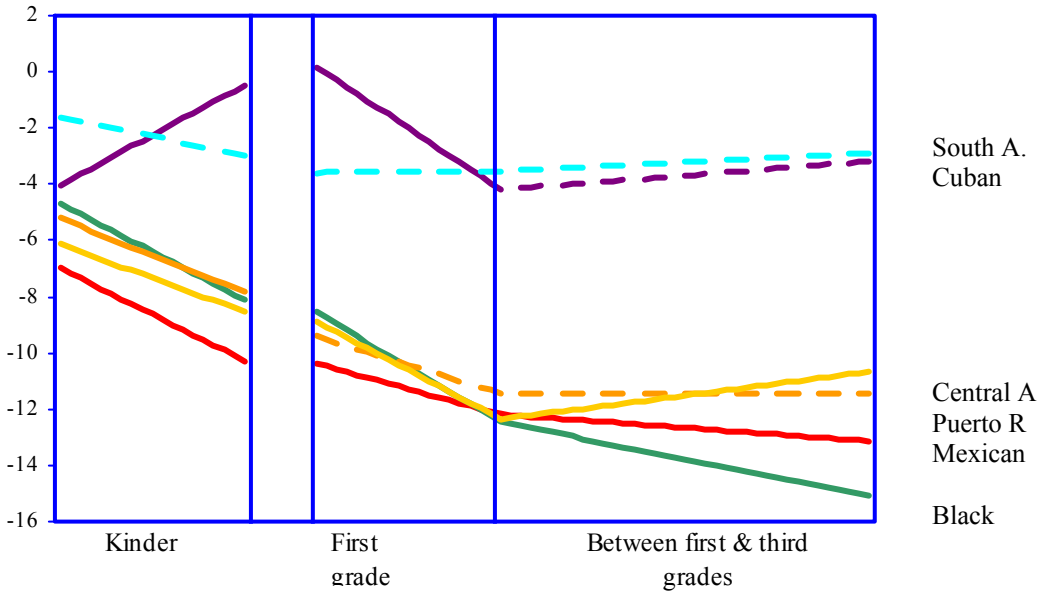
During kindergarten and first grade, second generation Central American and Mexican students show lower growth rates than White students. The second generation Mexican – White students' math achievement gap widens at a faster rate than the second generation Central American – White students' math gap. The opposite is true during first grade. From first to third grade, second generation Mexican students continue having lower growth rates than White students, but second generation Central American students show higher growth rates than White students. These results suggest that during this period, the Mexican – White students' math achievement gap widens and the Central American – White students gap narrows. By the end of third grade, math achievement gaps between White students and second generation Mexican, and Central American students at least doubles.

These results, as predicted by the Segmented Assimilation theory, illustrate two clearly different paths of math learning trajectories for Hispanic students. On the one hand, Cuban and South American students have math trajectories similar to White students. On the other, Central American, Puerto Rican, and Mexican students show math trajectories similar to Black students. Additionally, these results show that after first grade, Central American, Puerto Rican, and Mexican students' math trajectories

begin to differ from Black students' learning trajectories; showing higher growth rate than Black students.

Figures 6.6

Second Generation Hispanic Students' Estimated Math Achievement Gaps by Country of Origin



Note: White students reference group; measured in IRT scores; dashes mean that the growth rate gap is not significant

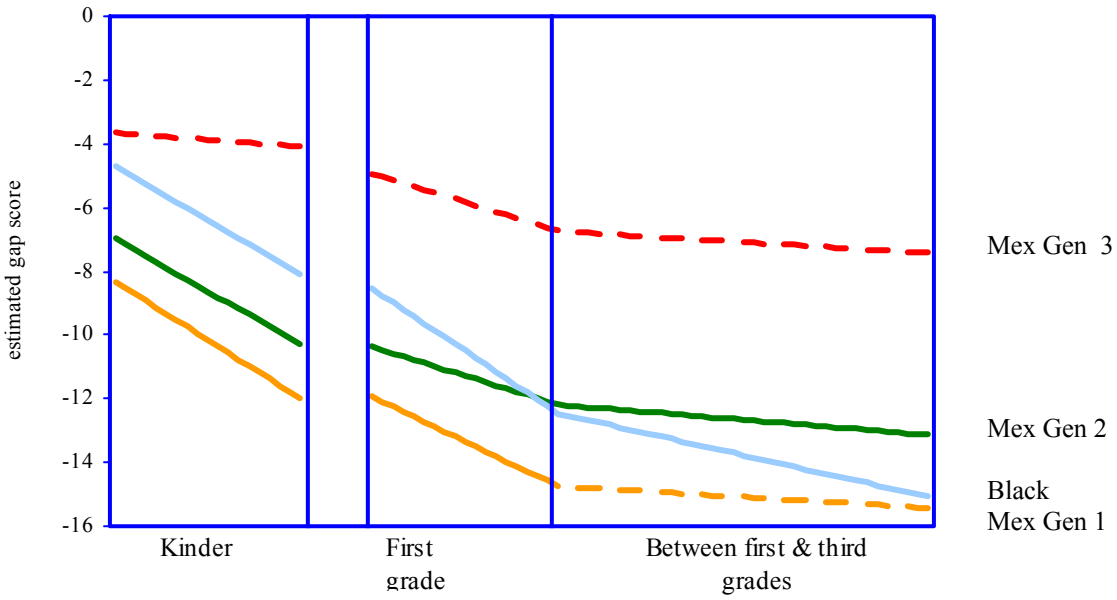
Figure 6.7 illustrates math learning trajectories for Mexican students by generational status. Mexican students' math learning trajectories vary by generational status, particularly at kindergarten entry and during kindergarten. At kindergarten entry, first, second, and third^{+} generation Mexican students' math scores are 9, 7, and 3 points lower than White students' scores (see Figure 6.5). During kindergarten, the math achievement gaps between White students and first and second generation Mexican

students grow faster than the gap between White students and third+ generation Mexican students.

From first to third grade, second generation Mexicans' math achievement gap widens at significant rates. Indeed, the gap widening between Mexican and White students during kindergarten applies only to first and second generation Mexicans and the gap widening from first to third grade mainly applies to second generation students. By the end of third grade, Mexican first and second generation students' average math scores are 16 and 13 points lower than White students' scores. The gap between third^{+} generations and Whites only reaches 6 points. Thus, among Mexicans, first and second generation students are the most disadvantaged.

Figures 6.7

Mexican Students' Estimated Math Achievement Gaps by Generational Status



Note: White students reference group; measured in IRT scores; dashes lines mean that the growth rate gap is not significant

Summary

Results shown in this chapter reveal the complexity of Hispanic students' math learning trajectories between kindergarten and third grade, complexity that is generally masked, when Hispanics of different countries of origin and generations are combined in one pan-ethnic group. Significant differences in math learning trajectories are discovered across Hispanic groups, and between these Hispanic students and White and Black students.

These results confirm that, on average, Hispanic students enter kindergarten with lower math skills than White students (Jencks and Phillip 1998; Lee and Burkham 2002). Hispanic students arrive to school with significant disadvantages, which are translated into lack of school readiness, at least for math cognitive skills. Contrary to studies showing that, on average, Hispanic and Black students' math achievement at kindergarten entry tend to be similar but lower than White students', this research indicates that some particular Hispanic groups indeed perform better than Blacks, while others perform worse. Specifically, third^{+} generation Mexican and South American students have higher initial math scores than Black students. In contrast, first and second generation Mexican and Central American students have lower average math score than Black students.

At kindergarten entry, differences in math initial scores are observed between White and Hispanic students by country of origin and generational status. Particularly, first generation Mexican, Cuban, Puerto Rican, and Central American students have very low math scores at kindergarten entry.

Between kindergarten and third grade, third^{+} generation Mexican students, and South American students show similar growth rates as White students. However, reaching parity with White students does not remedy the Mexican and South American students' educational disadvantages experienced at the start of kindergarten. During this time period also, Hispanic students from these groups have higher growth rates than Black students. During kindergarten, significant growth rate gaps are observed between first and second generation Mexican, Cuban Puerto Rican, and Central American students and White students. Hispanic students have significantly lower growth rates than do White students, except for Cuban students. Cuban students have significantly higher growth rates than do White students. By the end of kindergarten, Cuban students' math scores are similar to White students' scores.

Overall, between first and third grade, less evidence of growth rate gaps is observed than during kindergarten. During first grade, math growth rate gaps are observed between second generation Mexican, Central American and Puerto Rican students and White students. In all these cases, Hispanic students have lower growth rates than do Whites.

From first to third grade, significant and positive growth rates are observed for Hispanic students of distinct countries of origin, except for Mexican second generation students who have a significantly negative average growth rate. These results suggest that during these school years, math achievement gaps between White students and Cuban, Central America and Puerto Ricans also narrow.

After analyzing students' math growth rates between kindergarten and third grade, three findings can be highlighted. First, each period of time studied has different

growth rates, suggesting that schooling during these years has their own particularities. The smaller growth rates observed during kindergarten and not during first grade can be related to differences in learning structure between these grades.

Second, even though White students tend to show significantly higher growth rates than Hispanic students, the math growth rate gaps between them decrease over time. Math learning differences between White and Hispanic students remained until third grade; however, at each additional grade, they increased at a slower pace. For instance, the growth rate gap between White and Mexican students are .28 points/month during Kindergarten, .19 points/month during first grade, and .04 points/month from first to third grade.

Third, these results show a convergence in growth rates over time among Hispanics, which imply the elimination of growth rate gaps, at least, by Hispanics' country of origins. During kindergarten we also observed major variability in growth rates among Hispanic students from distinct countries of origin. This variability decreases during first grade and almost disappears between first and third grade.

CHAPTER 7

RESULTS

Explaining Hispanic Students' Math Learning Trajectories, Effects of SES and English Ability

In this chapter, I investigate whether SES and English ability are related to Hispanic students' math outcomes, and the extent to which differences in English ability or SES account for group differences in math learning trajectories. In particular, this section answers the following research questions: how are Hispanic students' learning trajectories related to English ability and family SES?

To answer this research question, I first analyze variables commonly used as proxies for students' English ability (i.e. language used at home, oral language development test scores) and their SES. Descriptive statistics are weighted and analyzed by country of origin and generational status. When relevant, I present descriptive information for White and Black students as reference. Results from cells with less than 15 cases are not shown or discussed. Second, I present estimated coefficients from Models 5, 6, and 7. In Model 5, English ability is added to Model 4; Model 6 contains students' SES plus the variables in Model 5. Finally, Model 7 includes both English ability and SES to analyze their conditional association.

The discussion of this section focuses on estimated coefficients for the intercept (π_{0j}) and for kindergarten, first grade and first-third grade slopes (i.e. $\pi_{1j,}$ π_{3j} and π_{4j}), at the HLM level-two equation. See the methodology section on pages 106-111. Results of the complete HLM Models are reported in Appendix C, Tables C2 and C3. The final section of this chapter presents a summary of the main findings.

Descriptive Statistics

English Ability at Kindergarten Entry

In this section, I describe language variables such as main language used at home, OLDS score, and language used to answer a math test. Figure 7.1 shows percentages of Hispanic students residing in homes where English is not spoken. Figure 7.2 shows percentage of students who took math test in Spanish, which is a comparable indicator across groups. Finally, Figure 7.3 presents Hispanic students' mean scores on the OLDS test applied to students living in non-English speaking homes and is therefore not comparable across Hispanic groups. However, I decided to present it here because it gives important information about the most language-disadvantaged students. See the methodology section on page 96 for a detailed description of these variables.

Language used at home

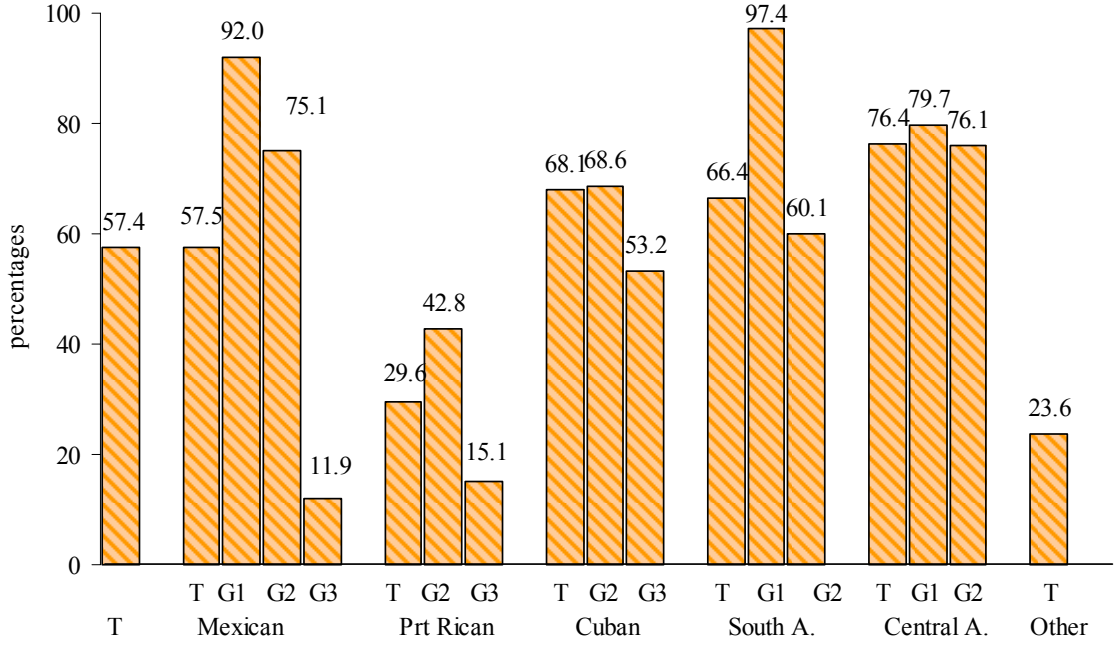
As seen in figure 7.1, more than half of Hispanic kindergarteners live in non-English speaking homes, which is not surprising given the large number of Hispanic

students with foreign-born parents. Compared to national estimates which find that 78.6% Hispanics live in homes where English and Spanish are spoken (U.S. Census 2000), this percentage is smaller when it refers to younger cohorts.

Important variability in language used at home is observed by Hispanic country of origin. Puerto Rican students are the most likely to live in homes where English is spoken because they are predominantly third+ generation, and/or because English language is a mandatory second language in their native country (Nieto 2000). In contrast, Central American students are more likely to live in homes where Spanish is spoken than any other Hispanic student group.

Figure 7.1

Hispanic Students in non-English Speaking Homes by Country of Origin, and Generational Status



Note: T = total, G1 = first generation, G2 = second generation, and G3 = third+ generation

Further, the percentage of Hispanic students living in non-English speaking homes decreases by generational status, except for Central American students. For Mexican students this tendency is pronounced. Almost all first generation Mexican students live in non-English speaking homes while less than 15% of third^{+} generation Mexican students do. Less pronounced generational differences are observed in the case of Puerto Rican and Cuban students. These results support previous findings regarding language shift by generational status (López 1999; Portes and Rumbaut 2001). It is not uncommon to find high percentage of first generation Hispanics that only speak Spanish, however, third^{+} generation Hispanics either speak only English at home or use both languages (Pew-Latino-Center 2005). Cuban families seem to be an exception showing unexpected high percentage of native language maintenance in third^{+} generation, which might be related to Cubans' propensity of living in ethnic enclaves.

Math test taken in Spanish

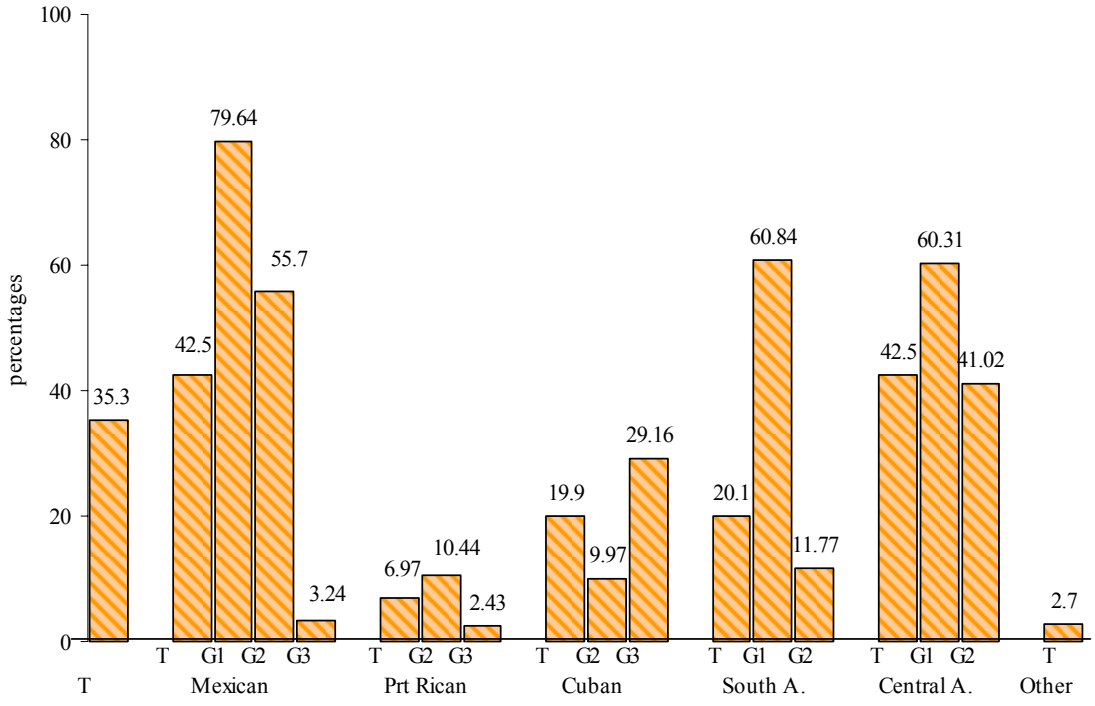
Overall, in the fall of kindergarten, about one third of Hispanic students took the math test in Spanish (see Figure 7.2). About 50% of Mexican and Central American students answered the math test in Spanish compared to 20% of Cuban and South American students, and less than 10% of Puerto Ricans. Cuban and South American students' *low* percentages of non-proficiency in English are surprising given that most of them live in non-English speaking homes; casting doubt on settled research connecting the use of Spanish at home with lack of English proficiency (Baker 1998; Porter 2001).

Additionally, the percentage of students who took the math test in Spanish decreased by generational status. A higher percentage of students taking the math test in

Spanish are observed for first generation Mexican students than for second generation students. Close to 80% of first generation Mexicans took the test in Spanish while only 3% of third^{+} generation Mexicans did. Similar trends are found for Puerto Rican, South American, and Central American students.

Figure 7.2

Hispanic Students that Took Math Test in Spanish by Country of Origin and Generational Status



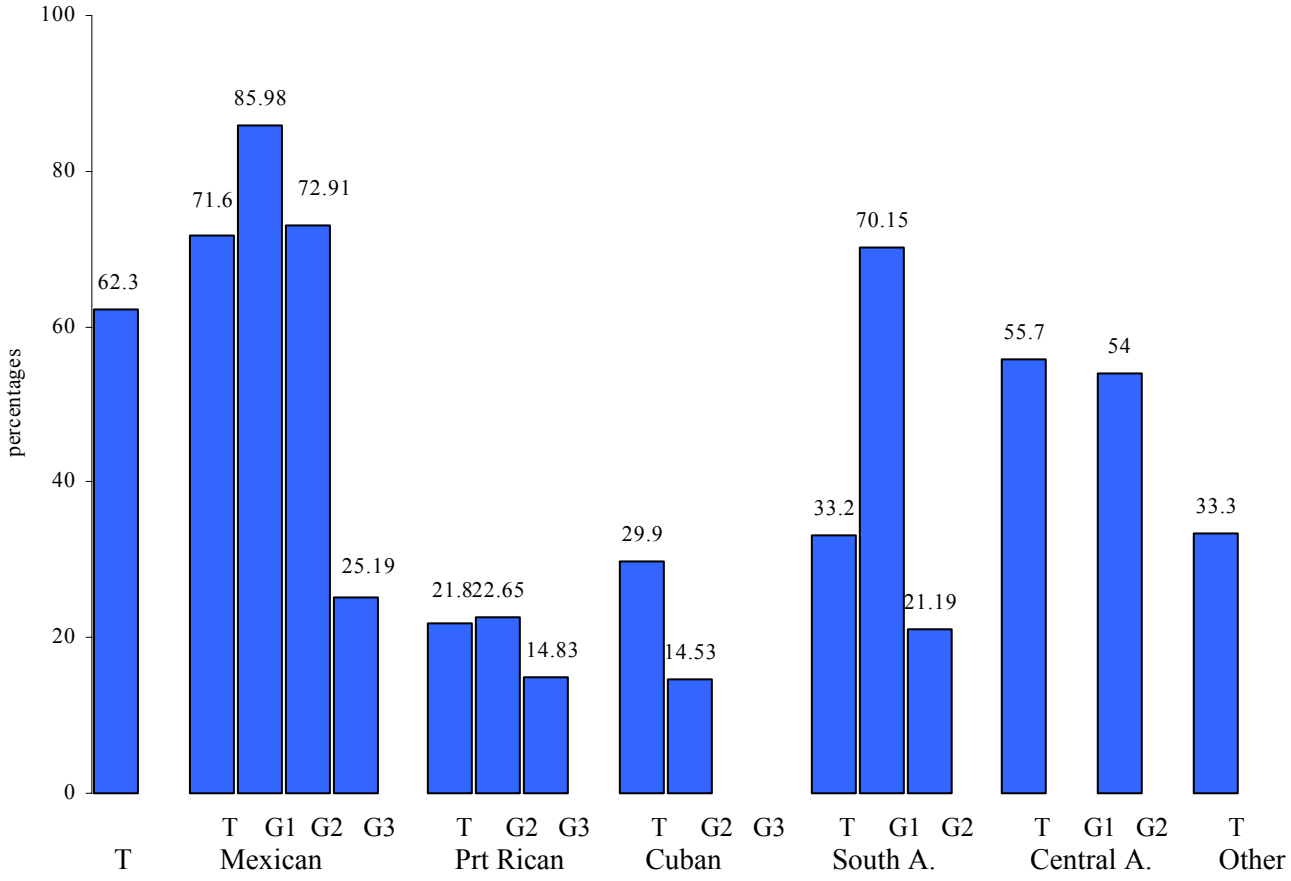
Note: T = total, G1 = first generation, G2 = second generation, and G3 = third+ generation

Failed the OLDS test

Figure 7.3 shows that more than half of Hispanic students living in non-English speaking homes failed the OLDS test. Among Hispanic students living in non-English speaking homes, Mexican and Central American students show higher percentages of failing the OLDS than the remaining Hispanic groups, suggesting that these students are likely to be non-English proficient. In contrast, Puerto Rican, Cuban, and South American students show lower percentages of students failing the OLDS test.

Figure 7.3

Hispanic Students that Failed the OLDS by Country of Origin and Generational Status



Note: the denominator is the number of students from each group coming from non-English speaking homes; T = total, G1 = first generation, G2 = second generation, and G3 = third^{+} generation

The percentage of students failing the OLDS test decreases by generational status. For instances, greater percentages of students failing the OLDS are found among first generation Mexican students than among second generation. Particularly significant drops in percentages are found between second generation and third^{+} generation Mexican students which suggest that English ability may be more related to parents' nativity than to students' place of birth. A similar significant drop in students' English ability is observed between first generation and second generation South American students.

Socioeconomic Status

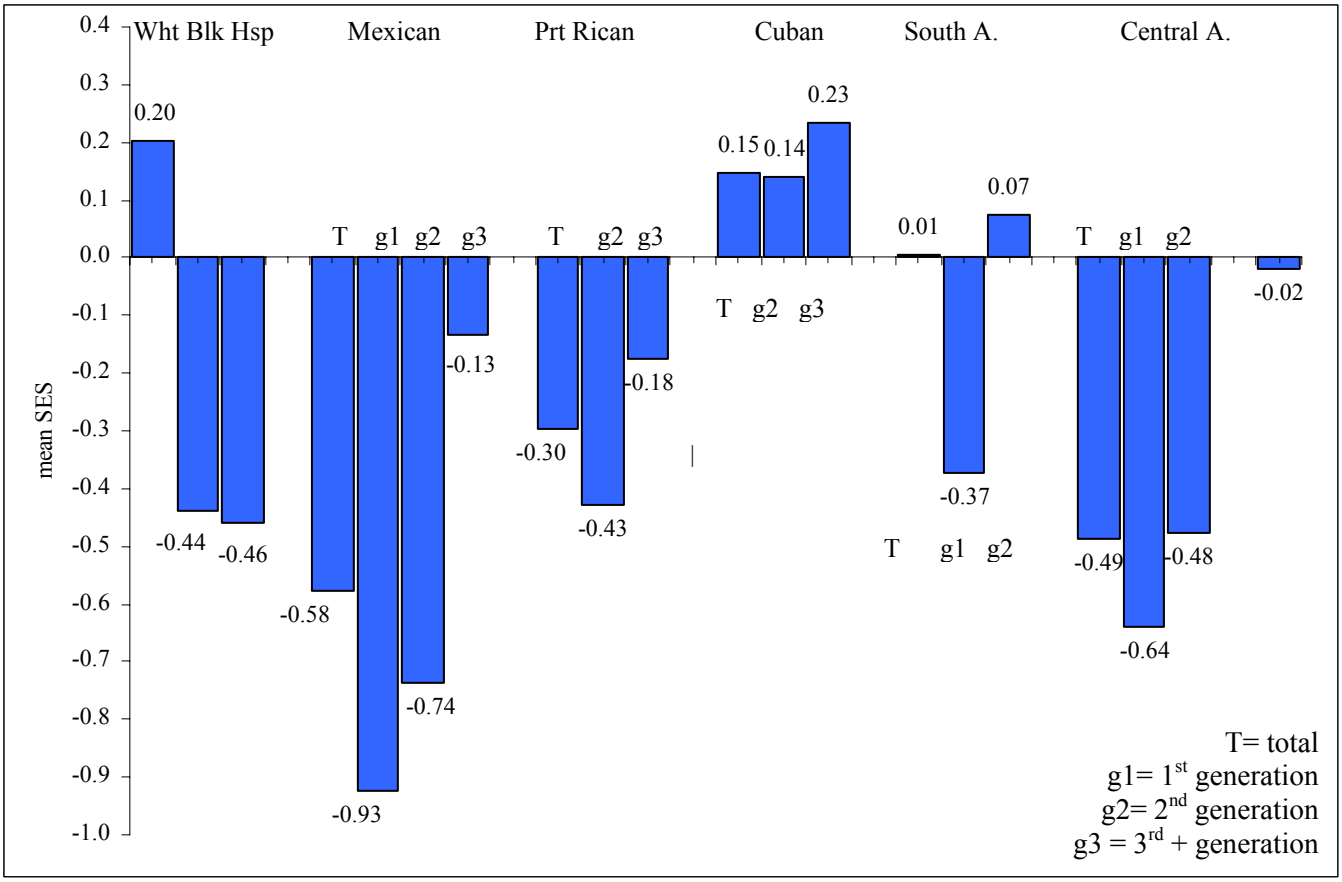
Figure 7.4 presents mean SES measured in standard deviation units for Hispanic, White and Black Kindergarteners. Overall, Hispanic and Black students' SES level are similar (-0.5 standard deviations bellow average) but far below White students (0.2 standard deviations above average). Among Hispanics, significant variability in mean SES is found by country of origin. Indeed, Hispanic students from any country of origin have lower SES than do White students, except for Cuban students who have similar average SES than do White students. Further, Mexican, Puerto Rican, Cuban, and South American students show different SES levels than Black students; Mexican students being the only ones with lower SES than do Black students.

Further, Figure 7.4 shows that SES gaps differ by generational status. For instance, the average SES for first and second generation Mexican students are approximately 0.9 and 0.7 standard deviation units, which are significantly lower than the average SES observed for Black students. However, third^{+} generation Mexican students

have higher SES levels than Black students. A similar pattern is found for Puerto Rican students whose third+ generation students have higher SES than do Black students.

Figure 7.4

Students SES by Race/Ethnicity, Country of Origin, and Generational Status



English Ability at Kindergarten Entry and SES Effects on Math Learning Trajectories

In this section, I analyze the relative importance of English ability and SES for explaining differences in initial math score and growth rates among Hispanic groups, and between Hispanic students and Black and White students. Here also, I discuss three models. Model 5 includes race/ethnicity, Hispanic students' countries of origin, Hispanic

students' generational status, and English ability. Model 6 includes the same variables as Model 5 but replaces English ability with SES. Model 7 includes all the variables previously mentioned.

Overall Hispanic students' English ability and SES effects

At kindergarten entry, both English ability and SES are significantly related to math scores. Hispanic students with higher English ability or SES are likely to have higher average math scores at kindergarten entry. As Table 7.1, Model 5 shows, after adjusting for English ability, Latino students residing in non-English speaking homes average math score at kindergarten entry is 3.2 points lower than the average math scores observed for Latino students living in English speaking homes. Further, each unit-increase in the OLDS scores is associated with a 1.1 points increase in initial math scores.

Moreover, each unit-increase in SES is associated with a 4.2 points increase in the average math score at kindergarten entry suggesting that students from higher SES arrive to school with better math English and Skills.

When both variables are included in the model, the OLDS score coefficient is reduced to 0.2 becoming insignificant and the non-English speaking home coefficient is reduced to 1.34 remaining significant (see Model 7). After controlling for SES, students living in non-English speaking homes math average score is more than one point higher than the math average score observed for students living in English-speaking homes. These results suggest that some of the association between English ability and math initial score is due to the association between SES and math score.

During kindergarten, significant associations between math growth rates and English ability and SES are also observed. Math growth rates for Hispanic students living in non-English speaking homes are 0.21 points/month lower than the math growth rate observed for Hispanic students living in English speaking homes. Additionally, English proficiency is also positively associated to kindergarten math growth rates. Each unit increase in the OLDS scores is associated with a 0.17 points/month increase in growth rates. Higher SES is also associated to higher growth rates; each unit-increase in SES is associated with 0.17 points per month increase in kindergarten math growth rates.

When both variables are included in the Model, the English ability effect slightly decreases to 0.15 remaining significant; indicating that the association of English ability or SES on math growth rates is mostly independent. Both variables have important effects in reducing growth rate gaps between White students and Hispanic students.

During first grade, as shown in Table 7.1 SES mainly is associated to higher math growth rates. Each unit-increase in the SES measured is related to a 0.12 points/month increased in math growth rates. Language at home is not significantly related to math growth rates and higher OLDS scores is associated to higher math growth rate during first grade. When both variables are combined in the Model, the English ability effect becomes insignificant suggesting that during first grade, higher math growth rate are mostly related to students' SES levels.

From first to third grade, both SES and English ability show significant effects on growth rates. Each unit-increase in the OLDS score and in SES is associated with 0.08 and 0.04 increases in growth rates respectively. As was the case during kindergarten, SES and English ability seem to have independent effects on math growth rates.

Table 7.1

Estimated Effects of English Ability and SES on Initial Math Score and Growth Rate Gaps

	Model 5 Language		**Model 6** SES		**Model 7** Language and SES	
At kindergarten Entry						
Non-English speaking homes	-3.19	**			-1.34	**
	(0.35)				(-0.34)	
OLDS scores	1.08	**			0.2	
	(0.19)				(0.18)	
SES			4.18	**	4.14	**
			(0.12)		(0.13)	
During kindergarten						
Non-English speaking homes	-0.21	***			-0.15	**
	(0.05)				(0.05)	
OLDS scores	0.17	***			0.15	***
	(0.03)				(0.03)	
SES			0.15	***	0.14	***
			(0.01)		(0.02)	
During first grade						
Non-English speaking homes	0.01				0.06	
	(0.09)				(0.09)	
OLDS scores	0.09	+			0.07	
	(0.05)				(0.05)	
SES			0.12	***	0.12	***
			(0.03)		(0.03)	
From First to Third grades						
Non-English speaking homes	-0.06	+			-0.04	
	(0.03)				(0.03)	
OLDS scores	0.09	***			0.08	***
	(0.02)				(0.02)	
SES			0.05	***	0.04	***
			(0.01)		(0.01)	

Note: ** p-value<=0.01, * p-value<=0.05, + p-value<=0.1; standard errors in parentheses

Further, Table 7.1 shows that, overall, SES and English ability effects on growth rates decreases over time. The effect of English ability on math growth rates is reduced from 0.17 points per month during kindergarten to 0.09 points per month after the end of kindergarten. Similarly, the SES effect on growth rates is reduced from 0.14 points per month during kindergarten to 0.04 points per month from first to third grade, dropping drastically after the end of first grade. These results suggest that English ability and SES characteristics have a context specific pattern of influence as opposed to a stable pattern of influence on educational outcomes. Moreover, these results indicate that additional factors might become more influential as students progress in schooling and that the universality belief that SES is the most important variable associate to students' educational outcomes might not be necessarily true for some grades or contexts.

Changes in Estimated Coefficients after Including English Ability and SES on Math Score at Kindergarten Entry

Recall from Table 6.3 Model 4, that math score gaps at kindergarten entry were observed between White students and Hispanic subgroup students. Overall, Hispanic students have lower initial math scores at the star of kindergarten than do White students. Similar findings were observed for second generation students from different countries of origin and for first generation Mexican students. Also, remember that at kindergarten entry, both English ability and SES are significantly related to math scores (see Table 7.1).

Table 7.2 indicates that at kindergarten entry, English ability and SES play a significant role in reducing average math score gaps between Hispanic and White students. After including either or both variables in the model, average scores gaps between White and Hispanic students are reduced. For instance, the gap between White students and first generation Mexican students is reduced by 72.3% when both variables are included in the model. Also, the White – Cuban students' gap in average math score at kindergarten entry is reduced by 69% after controlling for students' English ability.

Further, although English ability and SES have a significant role in reducing math scores at kindergarten entry, these variables do not totally explain math score gaps between most of Hispanic subgroups and White students. Being Cuban and South American students the only exception. After including English ability alone in the models math score gap between White students and South American and Cuban students became non-significant; suggesting that the math knowledge at kindergarten entry is explained by South American and Cuban students' English ability. Thus, during kindergarten, improving English ability would put South American and Cuban students' math scores at par with White students. Recall that South American and Cuban students had greater language than SES disadvantages (see Figures 7.2, .73, and 7.4).

Moreover, results presented in Table 7.2 indicate that the importance of students' English ability and SES in reducing Hispanic - White students math gaps vary by Hispanic subgroup. For example, English ability has a greater effect than SES in reducing the math score gap between South American and White students, and between White and Cuban students. In contrast, SES has bigger effects than English ability in reducing the Mexican–White, Puerto Rican–White, and Central American – White

students' achievement gaps. Partly because these Hispanic student groups have lower SES than South American and Cuban students (see Table 7.2). Also, compared to White students, for third^{+} generation Mexican students, the average math score gap is reduced by 37.8% after including SES in the models while the gap reduction is only around 5% after including English ability in the model.

Table 7.2

Changes in Estimated Coefficients after Including English ability and SES on Math Initial Score

	Model 3 country of origin	Significant Differences	Model 4 generational status	Significant Differences	Model 5 Language	Significant Differences	Model 6 SES	Significant Differences	Model 7 Language + SES	Significant Differences
		White		White		White		White		White
Black	-4.68	**	-4.69	**	-4.69	**	-1.99	**	-2.02	**
Mexican	-6.10	**			-3.76	**	-2.78	**	-1.98	**
Mex Gen 1			-8.32	**	-4.85	**	-3.61	**	-2.35	**
Mex Gen 2			-6.99	**	-4.35	**	-3.00	**	-1.99	**
Mex Gen 3+			-3.66	**	-3.33	**	-2.20	**	-2.05	**
Cuban	-3.35	**			-1.28		-3.25	**	-2.33	*
Cuban Gen 1			-6.91	**	-3.97	*	-6.34	**	-5.11	**
Cuban Gen 2			-4.04	**	-2.36	*	-3.82	**	-2.96	**
Cuban Gen 3+			0.31		1.76		-0.15		0.53	
Puerto Rican	-4.43	**			-3.46	**	-2.16	**	-1.77	**
Prto R Gen 1			-7.03	**	-5.24	*	-4.30		-3.50	
Prto R Gen 2			-5.21	**	-3.99	**	-2.40	**	-1.83	*
Prto R Gen 3+			-3.45	**	-3.10	**	-1.74	*	-1.57	*
South A.	-2.46	**			-0.40		-1.84	**	-0.94	
South A Gen 1			-7.46	**	-4.47	**	-5.67	**	-4.44	**
South A Gen 2			-1.61	+	-0.07		-1.20		-0.42	
Central A.	-6.08	**			-3.33	**	-3.21	**	-2.19	**
Central A Gen 1			-5.61	**	-2.63	+	-2.51	*	-1.40	
Central A Gen 2			-6.14	**	-3.82	**	-3.31	**	-2.34	**
Other Hsp	-1.64	*			-0.93		-0.65		-0.35	
Other Gen 1			-3.91	+	-1.83		-3.37		-2.32	
Other Gen 2			-1.80	+	-0.93		-0.99		-0.60	
Other Gen 3+			-1.36		-1.08		-0.22		-0.07	

Note: ** p-value<=0.01, * p-value<=0.05, + p-value<=0.1; standard errors in parentheses

Changes in Estimated Coefficients after Including English ability and SES on Math Growth Rate Gaps

During Kindergarten

Recall from Table 6.4, Models 3 and 4 that during this time period, growth rate gaps were observed between White students and Puerto Rican, Cuban, and Central American students. These Hispanic subgroup students have lower math growth rates than do White except for Cuban students, whose kindergarten growth rate is higher than the rate observed for White students. Compared to White students, smaller growth rates were observed for second generation Puerto Rican, Cuban, and Central American students, and for first generation Mexican students. Additionally, remember that both students' English ability and SES have important effects in reducing growth rate gaps between White students and Hispanic students.

Table 7.3 presents changes in Hispanic and White students' growth rate gaps after including English ability and SES in the models. This table indicates that although after including both variables in the model, the White – Hispanic subgroup students' growth rate gaps are reduced; English ability alone eliminates growth rates gaps between White and first generation Mexican students, and between White and Central American students. These results suggest that language barriers is an important factor for understanding first generation Mexican and Central American students math outcomes. For second generation Mexican students, English ability and SES eliminate the White – second generation Mexican students' growth rate gap.

Table 7.3

Changes in Estimated Coefficients after Including English ability and SES on Math Growth Rate during Kindergarten

	Model 3		Model 4		Model 5		Model 6		Model 7	
	country of origin	Significant Differences	generation al status	Significant Differences	Language	Significant Differences	SES	Significant Differences	Language and SES	Significant Differences
		White		White		White		White		White
Black	-0.38	***	-0.38	**	-0.38	**	-0.29	**	-0.29	**
Mexican	-0.28	***			-0.10	*	-0.15	**	-0.04	
Mex Gen 1			-0.41	**	-0.13		-0.24	**	-0.04	
Mex Gen 2			-0.37	**	-0.16	**	-0.22	**	-0.08	
Mex Gen 3+			-0.05		-0.04		0.01		0.01	
Cuban	0.33	**			0.43	**	0.33	**	0.39	**
Cuban Gen 1			0.30		0.50	+	0.32		0.47	+
Cuban Gen 2			0.40	**	0.45	**	0.41	**	0.43	**
Cuban Gen 3+			0.14		0.22		0.13		0.18	
Puerto Rican	-0.34	***			-0.29	**	-0.25	**	-0.24	**
Prto R Gen 1			-0.77	**	-0.67	**	-0.66	**	-0.59	*
Prto R Gen 2			-0.29	**	-0.25	**	-0.19	+	-0.18	+
Prto R Gen 3+			-0.32	**	-0.31	**	-0.26	**	-0.26	**
South A.	-0.12				0.01		-0.10		-0.03	
South A Gen 1			0.12		0.32	+	0.17		0.31	+
South A Gen 2			-0.15		-0.09		-0.14		-0.11	
Central A.	-0.28	***			-0.08		-0.17	*	-0.04	
Central A Gen 1			-0.38	*	-0.14		-0.24	*	-0.06	
Central A Gen 2			-0.27	**	-0.11		-0.17	*	-0.06	
Other Hsp	-0.06				-0.03		-0.03		-0.02	
Other Gen 1			-0.13		0.01		-0.11		-0.03	
Other Gen 2			0.04		0.08		0.07	**	0.10	
Other Gen 3+			-0.13		-0.13		-0.09		-0.09	

Note: ** p-value<=0.01, * p-value<=0.05, + p-value<=0.1; standard errors in parentheses

In contrast, the growth rate gap between Puerto Rican and White students is not eliminated after including either of these variables in the model. After including

students' English ability in the model the growth rate gap is reduced by 15%, and after including SES the growth rate gap is reduced by 25%. Also, the Cuban students' advantaged in growth rates, in comparison to White students, remain the same after including SES in the model and increases by .10 points/month after including students' English ability. These results suggest that for Puerto Rican and Cuban students additional factors not included in the model might be related to their kindergarten growth achievement gaps.

During First grade

Recall from Table 7.4, Models 3 and 4 that during this time period, growth rate gaps were observed between White students and Puerto Rican, Central American, and Mexican students. Statistically significant lower growth rates were observed for second generation Mexican, Central American and Cuban students than for White students. A similar pattern was observed for first generation Mexican students. In addition, during this period of time mostly SES, rather than students' English ability, is associated to higher math growth rates.

As discussed in previous sections, during first grade SES is more important than English ability in reducing growth rate gaps between White and Hispanic subgroup students. For instance, including SES in the model eliminates the White – second generation Mexican, the White – first generation Mexican, and the Central American – White students' math growth rate gaps.

Also, compared to White students, including English ability increases the first grade growth rate gaps for second generation Central American, Mexican, Cuban and

Puerto Rican students. Thus, during first grade, the second generation advantages in English ability at kindergarten entry somewhat neutralizes the math growth rate gaps observed between Hispanic and White students.

Table 7.4

Changes in Estimated Coefficients after Including English ability and SES on Math Growth Rate during First Grade

	Model 3 country of origin	Significant Differences White	Model 4 generation al status	Significant Differences White	Model 5 Language	Significant Differences White	Model 6 SES	Significant Differences White	Model 7 Language and SES	Significant Differences White
Black	-0.44	***	-0.44	**	-0.43	**	-0.35	**	-0.35	**
Mexican	-0.17	***			-0.11	+	-0.07		-0.06	
Mex Gen 1			-0.31	+	-0.31		-0.17		-0.23	
Mex Gen 2			-0.20	**	-0.22	*	-0.09		-0.14	
Mex Gen 3+			-0.06		-0.07		-0.02		-0.03	
Cuban	-0.25				-0.25		-0.24		-0.27	
Cuban Gen 1			-0.33		-0.26		-0.20		-0.19	
Cuban Gen 2			-0.49	*	-0.58	**	-0.47	*	-0.59	**
Cuban Gen 3+			0.50		0.47		0.48		0.43	
Puerto Rican	-0.29	*			-0.29	*	-0.21	+	-0.23	+
Prto R Gen 1			-0.78	*	-0.87	*	-0.70	*	-0.59	*
Prto R Gen 2			-0.22		-0.28		-0.14		-0.18	
Prto R Gen 3+			-0.28		-0.28		-0.22		-0.26	
South A.	-0.09				-0.09		-0.05		-0.10	
South A Gen 1			-0.95	*	-0.93	*	-0.86	*	-0.89	*
South A Gen 2			0.01		-0.09		0.03		-0.09	
Central A.	-0.29	*			-0.24	+	-0.20		-0.20	
Central A Gen 1			0.60		0.62		0.75		0.71	
Central A Gen 2			-0.39	**	-0.43	**	-0.30	*	-0.37	*
Other Hsp	-0.48	**			-0.46		-0.45	**	-0.44	**
Other Gen 1			-0.24		-0.18		-0.21		-0.19	
Other Gen 2			-0.75	**	-0.78	**	-0.73	**	-0.77	**
Other Gen 3+			-0.30	+	-0.30	+	-0.25		-0.26	

Note: ** p-value<=0.01, * p-value<=0.05, + p-value<=0.1; standard errors in parentheses

Moreover, Table 7.4 indicates that the effect of students' English ability and SES becomes less important during the first grade than during kindergarten and at kindergarten entry. After including either of these variables in the models, the White – Hispanic students' growth rate gaps do not change significantly except in the Central American and second generation Mexican students' case whose math growth rate gap become non-significant.

From First to Third Grade

During this time period, most Hispanic students' growth rates were positive, suggesting that the White – Hispanic gaps narrowed slightly. Particularly, second generation Mexican, Cuban, Puerto Rican, and Central American students have higher growth rates than do White students. The only growth rate gap that remains negative is the one between White and second generation Mexicans (see Table 5.6, Models 3 and 4).

As illustrated in Table 7.5, English ability and SES does not have much explanatory power in reducing the growth rate gaps between White and Hispanic students from different countries of origin. Recall that, between first and third grade, most of the Hispanic and White students' growth rate gaps were either nonexistent or positive (see Table 6.6, Models 3 and 4). However, English ability and SES jointly eliminate the growth rate gap between second generation Mexican and White students. Recall from Table 6.6, Model 4 than second generation Mexican students were the only group with negative and significantly different growth rates compared to White students. For Central American students, English ability and SES increases the already significant and

positive growth rate by 60%, which suggests that these variables enhance better educational outcomes for second generation Central American students.

Table 7.5

Changes in Estimated Coefficients after Including English ability and SES on Math Growth Rate from First to Third Grade

	Model 3 country of origin	Significant Differences	Model 4 generational status	Significant Differences	Model 5 Language	Significant Differences	Model 6 SES	Significant Differences	Model 7 Language and SES	Significant Differences
		White		White		White		White		White
Black	-0.15	**	-0.15	**	-0.15	**	-0.12	**	-0.12	**
Mexican	-0.05	**			-0.02		-0.01		0.00	
Mex Gen 1			-0.04		0.07		0.01		0.09	
Mex Gen 2			-0.05	**	0.01		-0.01		0.04	
Mex Gen 3+			-0.04		-0.04		-0.02		-0.03	
Cuban	0.10	+			0.10	+	0.11	*	0.09	
Cuban Gen 1			0.54	**	0.59	**	0.52	*	0.56	**
Cuban Gen 2			0.06		0.06		0.06		0.05	
Cuban Gen 3+			0.04		0.05		0.04		0.05	
Puerto Rican	0.09	*			0.09	*	0.12	**	0.11	**
Prto R Gen 1			0.27	*	0.29	*	0.30	**	0.31	**
Prto R Gen 2			0.00		0.01		0.03		0.03	
Prto R Gen 3+			0.16	**	0.16	**	0.18	**	0.17	**
South A.	0.06				0.06		0.06		0.05	
South A Gen 1			0.20		0.26	*	0.21	+	0.25	*
South A Gen 2			0.03		0.04		0.04		0.04	
Central A.	0.09	*			0.11	**	0.12	**	0.12	**
Central A Gen 1			-0.02		0.06		0.01		0.06	
Central A Gen 2			0.09	**	0.14	**	0.13	***	0.15	**
Other Hsp	0.06				0.06		0.08	+	0.07	
Other Gen 1			0.29	*	0.33	**	0.30	**	0.32	**
Other Gen 2			0.14	+	0.15	+	0.16	+	0.16	+
Other Gen 3+			-0.01		-0.02		0.00		-0.01	

Note: ** p-value<=0.01, * p-value<=0.05, + p-value<=0.1; standard errors in parentheses

Summary

On average, Hispanic students in the Kindergarten class of 1998-99 are more likely to have foreign-born parents, to live in homes where a language other than English is commonly spoken, and to experience poverty. Hispanics students' English ability and SES vary by countries of origin and generational status, but not in a uniform way. On average, a high percentage of first and second generation Mexican students and first generation South American students live in homes where English is not spoken. These students are also likely to be non-English proficient, and to live in homes with lower SES than White students. In contrast, very high percentages of third^{+} generation Puerto Rican and Mexican students live in English speaking homes, and most of them are English proficient. Compared to White students, their family SES is lower, yet higher than Black students' SES.

Particularly surprising is the high percentage of Cuban students who are English proficient, given that a high percentage of them live in non-English speaking homes. These students also come from families with SES levels at similar levels with White students. Cuban students could be an important case for studying the effects of bilingualism on educational achievement; these students are more likely to live in non-English speaking homes yet are English proficient.

Overall, these results show the relative importance of English ability and SES in explaining math scores at kindergarten entry and growth rate gaps across grade levels and across Hispanics from different countries of origin and generational status. English ability is particularly important for reducing math gaps between White and both Cuban

and South American students at kindergarten entry. English proficiency is also important in explaining gaps between the first generation Mexican and White students. In contrast, SES has a greater effect in explaining growth rate gaps in the cases of second and third^{+} generation Mexican students, second generation Central American students, and second generation Puerto Rican students. More consistent English ability and SES effects are observed for some Hispanic groups than for others. Existing growth rate gaps between White and Mexican students are mostly explained by Mexican students' SES and language disadvantages.

Despite the potential effects of English ability and SES in explaining the math learning gaps, this study suggests that these variables' effects change over time; and they become less important in later grades. At kindergarten entry and during kindergarten, these variables have more pronounced effects in reducing math scores or growth rates gaps. However, from first to third grade, these variables only eliminated the second generation Mexican and White students' growth rate gap. It is important to notice that during this time period there is less variability in growth rates, at least from first to third grade.

After reviewing the variability in math score and growth rate gaps across Hispanic student groups, and the relative importance of SES and English ability in explaining these gaps, the next section links empirical findings to the theoretical framework that has guided this study. In that section, important connections between educational outcomes and English ability, SES, and Hispanic students' immigration experiences will be made.

CHAPTER 8

DISCUSSION AND CONCLUSION

In this study, I pay particular attention to Hispanic subgroups' differences in math achievement patterns between kindergarten and third grade, taking into account their diversity in country of origin and generational status. I analyze Hispanic subgroups' math knowledge at kindergarten entry and learning experienced during kindergarten, during first grade, and from first to third grade. Thus, what Hispanic students know when they arrive to school, and how much they learn between kindergarten and third grade to portray patterns of achievement, as opposed to analyzing achievement at one point in time. Hispanic subgroups' math achievement outcomes are compared to those observed for native non-Hispanic White, and native non-Hispanic Black.

Further, I investigate whether math achievement differences across Hispanic subgroups are related to differences in their immigration processes, SES and/or English ability. In this study, I analyze SES and English ability associations to Hispanic students' math knowledge at kindergarten entry and to math learned during each time period. In this way, I not only investigate the relative importance of these variables for math outcomes, but also I identify different effects on math outcomes over time.

The data for this study came from the Early Childhood Longitudinal Study – Kindergarten Cohort (ECLS–K). To estimate an average math score at kindergarten entry, and three growth rates, I use a longitudinal approach, analyzing math test scores obtained in five points of time – fall 1998, spring 1999, fall 1999, spring 2000 and spring

2002. By taking a longitudinal approach, this research provides an opportunity to look at educational outcomes beyond one point in time and also allows for the examination of differences in learning processes among Hispanic groups.

I use a piecewise linear growth model to estimate learning growth during kindergarten, in first grade, and between first and third grade. Hierarchical Linear Modeling is used to analyze two-level models –assessments nested within students.

The following summarizes the main results of my dissertation and elaborates on the most important findings based on literature review and theoretical considerations discussed in Chapters 2 and 3. Further, I discuss theoretical and political implications of my research, analyze future lines of research, and present the main limitations of my study.

Summary of Main Results

Research Questions 1 and 2: *What are the average Hispanic students' math learning trajectories in the early school years? How do math achievement patterns differ among Hispanic subgroups by country of origin and generational status?*

Overall, Hispanic students' arrive to school with lower math knowledge than do White and Black students, showing wider math knowledge gaps compared to White students than to Black students. Additionally, although all students regardless of race/ethnicity learn math skills and knowledge during the early school years, the average Hispanic student acquires less math skills than do White students, at least during kindergarten and first grade. Further, the overall Hispanic – White students' math

achievement gaps increased over time. These results suggest that the original math disadvantages observed among Hispanic students at kindergarten entry perpetuate over time. The White – Hispanic students' math achievement gap increases at a slower pace compared to the White – Black students' gap; showing a bigger math disadvantages for Black students than for Hispanic students over time.

Moreover, Hispanic students' math achievement patterns vary by country of origin and generational status in significant ways. Even though all Hispanic subgroups show lower math skills at the beginning of kindergarten than do White students, bigger gaps are observed for some Hispanic subgroups than for others. Similarly, differences in math trajectories are observed among Hispanic subgroups.

Based on their math achievement patterns, Hispanic students could be clustered in two distinct groups. The first group includes first and second generation Mexican students, Puerto Rican students of any generation, and Central American students of any generation students. These students start kindergarten with significant math disadvantages that persist until third grade. The second group includes third^{+} generation Mexican, Cuban, and South American students. Compared to White students, these Hispanic students show smaller differences in average math score at kindergarten entry, and similar math achievement patterns between kindergarten and third grade.

Similarly, the same two groups are observed when only second generation Hispanic students' math educational outcomes are analyzed. Second generation Mexican, Puerto Rican, Central American students experience math disadvantages, while their Cuban and South American counterparts show similar math outcomes as White students.

Math knowledge differences at kindergarten entry across Latino subgroups

Compared to White students, all Hispanic students have lower average math scores at kindergarten entry, showing significant math disadvantages existing prior to their begging school. Additionally, among Hispanic students, average math scores at kindergarten entry vary by country of origin and generational status. For instance, Mexican and Central American students have the lowest average math scores at kindergarten entry and the biggest math achievement gaps compared to White students. Likewise, lower average math scores at kindergarten entry are found for first and second generation Hispanic students than for their third^{+} generation counterpart when I analyzed the overall Hispanic sample or when I desegregated the sample by country of origin.

In contrast, South American students have the highest average math score at kindergarten entry among Hispanic students indicating that these students begin their schooling experiences with fewer math disadvantages than the remaining Hispanic subgroups.

Further, contrary to studies showing that math achievement gaps between Hispanic and Black students at kindergarten entry tend to be similar or lower compared to White students, this research indicates that some Hispanic subgroup students have higher average math scores at the beginning of kindergarten than do Black students, while others have lower math scores. For example, compared to Black students, Mexican and Central American students show lower average math scores at kindergarten entry, Puerto Rican and Cuban students have similar math outcomes, and South American students have higher math scores. Additionally, first and second generation Hispanic students have

lower average math scores at kindergarten entry than do Black students. However, most of third^{+} generation Hispanic students achieve higher math scores than do Black students, except for Puerto Rican students whose average math score is not significantly different than the average score observed for Black students.

M*ath growth rate differences across Hispanic subgroups during the early school years – including kindergarten, first grade, and between first and third grade*

Hispanic students' growth rates significantly vary by country of origin, generational status and time periods. For instance, third^{+} generation Mexican and South American students achieve parity with White students' growth rates between kindergarten and third grade, showing similar pattern of math achievement during this time period.

In contrast, second generation Mexican, Puerto Rican and Central American students have lower growth rates during kindergarten and first grade; meaning that compared to Whites, their math achievement gaps increased during kindergarten and first grade.

A reverse phenomenon is observed from first to third grade, where most Hispanic subgroup students have higher math grow rates than do White students suggesting that most of the Hispanic – White students math achievement gaps narrow during this time period. Albeit, these gaps narrow at a slower pace than the pace they grew during kindergarten and first grade. Mexican students are the most salient exception, having lower growth rates than do White students from first to third grade.

When only second generation Hispanic students are analyzed, Mexican, Puerto Rican, and Central America students' math growth rates during kindergarten are lower

than the one observed for White students. During first grade, Mexican and Central American students continue to have lower growth rates than do White students and after first grade, only second generation Mexican students continue to do so.

Moreover, these results suggest convergence in growth rates among Hispanic subgroups over time. For instance, growth rates of Hispanic students from different countries of origin are similar after first grade than before, showing decreasing variability in growth rates. Also, these results show tendencies of smaller growth rate gaps or improvement of math outcomes by generational status over time as observed when Mexican students' growth rate gaps between kindergarten and third grade are analyzed by generational status.

Further, White and Hispanic student' growth rate gaps decrease over time, as reflected by the bigger gaps during kindergarten than in later time periods. Compared to White students, most Hispanic students' math achievement gaps increase during kindergarten and first grade and either decrease or remain the same from first to third grade. These results indicate that, although math achievement differences between these students remain until third grade, the White – Hispanic math achievement gaps grew at a slower pace over time.

In contrast, Black and Hispanic students' growth rate gaps increase over time particularly after first grade. From first to third grade, Black students continue having significantly lower average growth rate than White students and all Hispanic students show higher growth rates than Black students.

Research Question 3: *Are differences immigration processes, SES or English ability related to Hispanic subgroups' math achievement patterns differences?*

As research shows, English ability and SES are strongly related to students' educational outcomes. Students with better English skills or those from families with higher SES levels are expected to achieve better educational outcomes than students who do not possess these qualities (Entwisle and Alexander 1993; Kao and Tienda 1995; Rumberger 2000; Garcia 2001; Padilla and Gonzalez 2001; Schmid 2001; Gándara, Rumberger et al. 2003; Rumberger and Arellano 2004; Crosnoe 2005; Marks 2005).

Overall, my research corroborates previous studies showing strong associations between students' educational outcomes and SES and English ability in the early school years. Between kindergarten and first grade, higher levels of SES or English ability are associated to better educational outcomes.

Additionally, this study points out that differences in English ability and SES are associated to differences in math achievement patterns among Hispanic subgroups, and that these variables have different explanatory power for understanding their math outcomes. Recall from Chapter 7 that important differences in language used at home, English ability and SES are observed across Hispanic subgroups. These results suggest that both English ability and SES have potential explanatory power for reducing White – Hispanic students' math achievement gaps in the early school years.

Importance of SES and English ability for Explaining Math Achievement Patterns across Hispanic Subgroups

English ability and SES have importance consequences for reducing or eliminating White - Hispanic students' math achievement gaps. However, the relative importance of each variable and their explanatory power vary by Hispanic subgroups. For some, English ability alone, or SES alone or both variables combined are needed to eliminate the White – Hispanic math achievement gaps. For instance, after including English ability alone in the model, the South American – White, and the Cuban – White students' initial math scores gaps become insignificant.[6] Additionally, English ability and SES combined eliminate the Central American - White students' growth rate gaps during kindergarten, and SES alone eliminate the first generation Mexican – White students' growth rate gap during first grade.

Moreover, the nature of the association between Hispanic students' math educational outcomes and English ability and SES changes over time. For instance, at kindergarten entry, English ability and SES effects on math outcomes are not independent; one can observe that part of the association between English ability and math scores is due to the association between SES and math scores. During kindergarten, both variables have important and independent effects in reducing growth rate gaps between White and Hispanic students. During first grade, changes in growth rate gaps are more related to SES than to English ability; consequently during this time period, SES shows a stronger effect than English ability. Finally, from first to third grade, one

[6] At kindergarten entry, English ability might be a proxy of educational experiences such as pre-school experiences or educational activities at home that could impact South American and Cuban students' math knowledge.

can observe significant and independent associations between math outcomes and English ability and SES.

Further, the explanatory power of SES and English ability weakens in later grades. At kindergarten entry and during kindergarten, both variables show more pronounced effects in reducing math achievement gaps between White and Hispanic students than in later time periods. Reasons that could explain why oral English ability at kindergarten entry might have less explanatory power in later grades could be related to the operationalization of English ability as variable. It is possible that in later grades, current oral English skills or higher-order English skills might have stronger association to math outcomes. Similarly, SES' lower explanatory power in later grades might be related to the increasing relevance of school characteristics. For instance, schools characteristics (i.e. educational resources in schools, teacher training and experiences, school practices and programs) might have greater explanatory power than SES and English ability between first and third grade. Thus, factors not included in this research might be more relevant for explaining Hispanic students' math disadvantages.

In sum, the main results of my dissertation are: First, overall, Hispanic students show math disadvantages during the early school years compared to White students. Although students of any racial/ethnic group learn math between kindergarten and third grade, increasing White – Hispanic students' math achievement gaps are observed over time. Second, Hispanic students' math achievement patterns vary by country of origin and generational status. Compared to White students, first and second generation Mexican, Puerto Rican students of any generation, and Central American students of an generations show greater math disadvantages than do third^{+} generation Mexican, South

American regardless of generational status, and Cuban, regardless of generational status. Third, SES and English ability are potential predictors for explaining Hispanic students' educational disadvantages. However, the nature of the relationship between these variables and math outcomes and their explanatory power vary across Hispanic subgroups and over time.

Interpretation of Main Findings

The main findings of my dissertation showed in the previous sections are analyzed taking in consideration the literature review and theoretical considerations presented in Chapters 2 and 3.

The Segmented Assimilation theory is particularly important for my results; this theory predicts differences in assimilation experiences across Hispanic subgroups, and provides a theoretical framework for understanding Hispanic subgroups' differences in math achievement patterns by country of origin. Recall that the Segmented Assimilation theory (Portes and Zhou 1993) argued that different immigrant groups assimilate into distinct sectors of the U.S. society, and that immigrants could become assimilated to the White middle class and therefore share their outcomes, economic and social advantages; or that immigrants could be part of the underclass culture and experience downward assimilation (Zhou 1997; Portes and Rumbaut 2001).

Results from this research support the Segmented Assimilation theory by finding two clearly different paths of math achievement patterns for second generation Hispanic immigrants. Based on this theory, we know that Mexicans and Central Americans are

likely to experience conflicting assimilation processes – and therefore negative math outcomes. First generation Mexican and Central Americans arrived to the host society with low human capital, faced an economic sector that does not provide them with opportunities for upward mobility, their ethnic communities were impoverish and commonly located in central cities, and they experienced adverse responses from the government and local citizens (Grosfoguel 1999; Durand, Massey et al. 2001; Portes and Rumbaut 2001; Kloosterman 2003). Particularly important for these Hispanic groups is the predominance of illegal immigration which is highly related to negative attitudes from the U.S. government and local citizens (Wallace 1986; Ramirez 2004).

This study suggests the importance of linking Hispanic students' educational outcomes and their immigration processes. By including factors such as immigration selectivity, timing of immigration, and immigrant assimilation as main theoretical considerations, I am able to provide a complex and systemic portrait of the context that surrounds Hispanic students' educational outcomes. Understanding differences in these factors have important consequences for the understanding of Hispanic subgroups' math achievement differences. Overall, Hispanics' immigration processes have important consequences for their access to resources which in turn impact Hispanic students' educational outcomes.

For instance, differences in immigration selectivity across Hispanic subgroups could be key in understanding differences in their educational outcomes. Immigration selectivity is related to the determinants of immigration that make some individuals more likely to migrate than others. Some individuals are more likely to migrate because of their particular characteristics, (i.e. motivations and resources), opportunity gaps between

the receiving and sending country, and costs and opportunities to immigrate (Borjas, 1987).

Resources that immigrants bring to the new country are one of the most important individual characteristics associated to immigration selectivity. Human and financial capital are key issues that facilitate or obstruct the adaptation processes and impact on educational experiences (Zhou 1997; Portes and Rumbaut 2001; Alba and Nee 2003; Rumberger and Arellano 2004). Typically, immigrants with higher levels of human or financial capital have greater opportunities in the new society by accessing better jobs, settling in better neighborhoods, attending excellent schools, among others.

To illustrate differences in immigration selectivity across Hispanic subgroups, I present Mexican and South American immigration. Among Latin American countries, immigration from Mexico is less selective. Fewer resources are required to migrate from Mexico to the U.S because of the geographical proximity of the two countries, U.S immigration policies that have unintentionally increased Mexican immigration, the long established networks that support immigration processes, and the economic - trade agreements. Consequently, many Mexican immigrants are part of the lower economic strata in Mexico therefore they do not have access to a big share of resources in their native country to facilitate their incorporation into the U.S. society.

In contrast, South American immigration is more selective. South American immigrants tend to arrive with greater levels of human and financial capital. Migrating to the U.S. requires more resources because of the geographical distance between South American countries and the U.S. and the lack of established immigration network that

facilitates the incorporation. As a consequence, South American children typically have access to important resources that could facilitate their learning experiences.

Further, Hispanic subgroups diversity in immigration experiences could be another important dimension for understanding differences in their educational outcomes. As reflected in Chapter 2, the importance of Hispanics immigration experiences has been emphasized in a number of ways. The economic, political and social contexts that receive immigrants can either reinforce original advantages for those that came with high levels of capital or can compensate with opportunities for those that came with low levels of capital.

Particularly, after 1965, the timing of immigration had important consequences for Hispanic groups' immigration experiences. Cuban immigrants coming to the U.S during the 60s had different immigration experiences than those coming during the 80s in terms of governmental support and reception of the U.S community.

For example, the U.S government support was particularly important for Cuban immigrants arriving before the 80s. They were typically granted refugee status which translated into greater opportunities for social and economic mobility. Children from these Cuban families therefore had more access to resources that impact academic success. Additionally, their initial greater opportunities for social and economic mobility were later translated to greater resources and solid ethnic Cuban communities. These communities became very important for the assimilation process for Cuban immigrants arriving after the 80s, who came with fewer resources and did not received economic support from the U.S. government (see page 30 for a detailed discussion about Cuban immigration history).

Along with greater levels of governmental support, Cuban immigrants also tend to be received by socially and economically stable Cuban communities which facilitate their transition into a new society (Copeland 1993; Portes and Rumbaut 2001; Alba and Nee 2003). Community support became even more important after the 80s when Cuban immigrants arrived with less financial capital. As a result of the human and financial capital available through their ethnic community, Cubans are likely to enter the workforce at higher levels thereby securing an income to adequately provide for their families. Subsequently, children from these families tend to be more prepared for school.

In contrast, Central American immigration experiences have been significantly less positive. Central American immigrants have not received as much support from the U.S. government and many of them are denied refugee status, often arriving into the U.S. as illegal immigrants and receiving no support from the government in terms of entrance and adaptation to the country. As a result, many Central American parents are forced to take low paying jobs which increase the likelihood that children from these families will not access adequate resources.

Also, Puerto Ricans tend to be received by communities that are fairly impoverished and often fragmented (Grosfoguel 1999; Baker 2002). Such circumstances do not generally facilitate high levels of occupational mobility for them, which have a direct effect on their ability to provide for the well being of their families.

Hispanic subgroups' immigration processes differences could be directly translated into differences in SES and English ability. Census data confirmed variability in SES and English characteristics among Hispanics. Recall from Chapter 2 that Mexican, Puerto Rican and some Central American countries have the lowest levels of

SES among Hispanics, and that foreign born Hispanics experience SES disadvantages compared to their third^{+} generation counterpart (U.S.-Census-Bureau 2003; Ramirez, 2004; Litcher, Qian et al. 2005).

Moreover, language used at home is related to individuals' generational status and country of origin. For instance, Latino foreign-born parents often use Spanish, and by the third generation, most individuals use English as their main language of communication. Although, it is more likely to observe this language shift in communities with extremely high concentration of Spanish speaking individuals (López 1999; Alba and Nee 2003). Also, Puerto Ricans are more likely to speak only English at home and to be English proficient than the remaining Hispanic subgroups (Ramirez, 2004).

Research shows that SES and English ability are very important predictors for Hispanic students' educational achievement and to understand Hispanic subgroups differences in math outcomes (Entwisle and Alexander 1993; Garcia 2000; Guo and Mullan 2000; Schmid 2001; Lee and Burkham 2002).

SES advantages are translated to better educational outcomes through access to resources, social capital, cultural capital, and school quality (DiMaggio 1982; Bourdieu 1986; Wojtkiewicz and Donato 1995; Hao and Bonstead-Bruns 1998; Driscoll 1999; Portes and Rumbaut 2001; Frankenberg and Orfield 2003; Pong, Hao et al. forthcoming; Rumberger and Palardy forthcoming).

Additionally, English ability is particularly important for students that have not yet acquired minimum levels of English proficiency who are mostly taught in English. Among Hispanics, particularly low English skills are observed for Mexican and Central American students, and higher English proficiency is observed for Puerto Rican students.

For these students, minimum oral English skills are required to understand contents of instruction and to be engaged in learning processes (Gándara 1999).

However, my dissertation indicates that the associations between SES and English ability and Hispanic students' math outcome vary across Hispanic subgroups. For those Hispanic students with greater language disadvantages, English ability has a greater explanatory power than SES for explaining math educational outcome; this is the case for Cuban and South America students. Thus, improving English ability for some Hispanic subgroups might have potential effects for putting these students' math scores at par with White students' scores. For students whose first language is other than English, good levels of competence in both languages could be translated in greater cognitive abilities. As discussed in Chapter 3, bilingualism has been associated with greater cognitive flexibility, and better classification and reasoning skills (Krashen 1999; Winsler, Diaz et al. 1999; Cummins 2000).

Moreover, different underlying processes might be involved in understanding what students know when they arrive to school, and what they learn during the early school years. Based on the school effects discussion presented in Chapter 3, I hypothesize different effects of English ability and SES at the beginning of kindergarten and while schools are in session. First, at kindergarten entry one could expect stronger effects of individual and family variables; students are not yet enrolled in schools therefore schools characteristics can not neutralize individual or family effects.

However, after schools are in session, school characteristics could counterbalance the association between English ability and SES on math achievement. For instance, school practices to support Spanish speakers may mediate the negative effects of non-

English proficiency students. These supportive practices aim to develop language skills, provide resources to students and facilitate the links between parents and schools (Garcia 2000). Special language services and instruction in both languages increase competences in English as well as in the native languages (Cummins 2000). The presence of Bilingual programs and the ability of teachers to speak Spanish could positively impact Hispanics learning experiences, especially for those with less fluency in English.

Similarly, the stronger English ability and SES associations to math outcomes observed during kindergarten than in later grades can be related to differences in structure and characteristics. Research show that kindergarten is less academic oriented than later school grades as only socialization roles are emphasized during kindergarten (Alexander, Entwisle et al. 1993; La Paro, Pianta et al. 2000; Burkham, Ready et al. 2004). At the same time, the greater variability in math achievement across Hispanic subgroups observed during kindergarten than in later grades could be related to the increased variability in educational activities, teacher behaviors, and time allocation commonly observed across kindergarten classrooms (Pianta, La Paro et al. 2000).

Political and Theoretical Implications of my Research

This research illuminates current discussions about race/ethnic educational inequalities by analyzing math outcome differences between Hispanic students and Black and White students. This study goes one step further by considering Hispanic students' diversity by countries of origin and when data allows, by generational status.

This study aims to inform policies and interventions geared towards improving Hispanic students' educational outcomes in the early school years by identifying Hispanic groups that are most educationally disadvantaged: first and second generation Mexican students, Puerto Rican students of any generation and Central American students of any generation students. Particularly, first and second generation Mexican students' arrive to school with extremely lower levels of math knowledge and their math achievement gaps increase during each time period compared to White students.

Moreover, this study took a longitudinal approach, going beyond cross-sectional analyses by identifying learning trajectories. Because I am interested in studying math learning as a process where it is likely that some children learn more rapidly than others, a longitudinal methodology is the best approach to identify patterns over time (Singer and Willet 2003). This methodology is also best suited to ascertain when SES and family effects begin and how these effects evolve over time.

Further, this study suggests Hispanic subgroups' and grade specific mechanisms that could reduce math learning gaps between Hispanic and White students. Identifying whether English ability or family SES has a substantial impact on reducing learning gaps is key information for policy decisions. For example, if English ability is the most significant factor in explaining educational outcomes within a particular time period or for a specific Hispanic group, perhaps interventions that seek to improve *parents'* English ability are necessary to reinforce students' English ability. At the school level, interventions could include recruiting Hispanic parents as language resource assistants in classrooms during the early years of schooling.

Additionally, this study suggests policy and interventions that are particularly geared towards specific grades, rather than focusing on levels of schooling (i.e. elementary, middle, high school). For instance, we now know that first and second Mexican students loose more ground between kindergarten and third grade than any other racial/ethnic group studied. Interventions targeted at this particular period of time should provide better educational opportunities for these students.

Further, this study has important theoretical implications. This dissertation points out the importance of taking into account Hispanic students' immigration characteristics, to understand their educational outcomes. Immigration processes, selectivity and experiences are key factors to understand Hispanic students' educational experience not only because more than 60% of the Hispanic population in the U.S have foreign-born parents, but also because the immigration characteristics impact Hispanic students English ability and SES characteristics, which in turn effect their educational outcomes.

Additionally, this study supports the Segmented Assimilation theory, by identifying two different patterns of math achievement. This finding corroborates Portes's and Rumbaut's (2001) postulates about the heterogeneity of immigrants' assimilation and the different paths that immigrants take to become part of the U.S. society.

Also, my dissertation reinforces the importance of taking into consideration individuals' development stages in formulating theories relating to educational outcomes. Young children's cognitive, emotional and social skills, their disposition and receptiveness toward learning can impact specific mechanisms in explaining their educational outcomes. Cultural arguments, including oppositional cultures and active responses to structural environments, seem less pertinent in explaining young children's educational outcomes.

This research contributes to the school effects literature by exploring math learning that occurs as a function of time periods or grades. Most of the theories used to explain educational outcome differences involving immigration populations rarely take into consideration that schools are primary institutions that significantly impact students' educational experiences. These theories mainly focused instead on individual or family human and social capital, or the role of communities and the state. Because children spend a great deal of their time in school settings, these social spaces need to be included in theoretical discussions attempting to explain educational outcome differences.

Limitations of the Study

This study has some important limitations that should be highlighted. Particular attention to the diversity of the Hispanic population, as expressed by differences in countries of origin and by generational status, is one of the main underlying assumptions of my research. Sample size limitation has restricted the possibility of further analyzing results considering the Hispanic diversity by generational status. My results show stable estimations by generational status mainly for Mexican students. It also shows precise estimation for second generation Puerto Rican, Cuban, South American, and Central American students.

An additional limitation refers to the Hispanic sample size. My results are based on 59.94% of the total Hispanic kindergarten – first grade longitudinal sample (4,006 students). Most of the cases not included in my analytical sample did not have re-scale math test scores based on the third grade math assessment. I dropped some additional

cases because of missing data on Hispanic country of origin. Students in the Hispanic excluded sample are more likely to be either second or third^{+} generation, changed schools between kindergarten and third grade, and have higher family SES and English ability levels.

I also identify two additional limitations. In my research, I was able to separate learning rates during kindergarten and first grade from learning that occurred during the summer. However, I was not able to separate learning rates while the school was in session after first grade. By estimating an overall growth rate from first to third grade, I am lumping together learning rates during the school year and during the summer, meaning that I could be underestimating learning rates occurring during the period after first grade.

I might have some misclassification in defining generational status and country of origin. Both students' generational status and Hispanic countries of origin are based on one parents' information; for most cases, information on both parents' country of origin was not available in the ECLS-K data. Consequently, I could be classifying some students as having a specific Hispanic origin or as being from a specific generation even though they might have interethnic origins.

Future Line of Research

The complexity of Hispanic students' math learning trajectories in the early school years has revealed several different lines for future research. Results from this study suggest that further research should be done to examine specifically why the gap between Latino and Black students widens dramatically after first grade while the Latino

- White gap narrows. Additionally, it is during this period that Puerto Rican and Central American students have higher growth rates compared to White students. Because we know that these gaps are not associated to students' SES or English ability, further examination is needed to determine social factors that could be playing an important role in the widening of the gap between Latino students and Black students.

Recent studies suggest the importance of schools for neutralizing social inequalities, at least, in the early school years (Entwisle and Alexander 1989; Entwisle and Alexander 1993; Alexander and Entwisle 1996; Downey, von Hippel et al. 2005). Based on differential learning rates during the summer and the school year, after controlling for family characteristics, Entwistle and Alexander (1989; 1993) concluded that schools have an independent impact on students' learning patterns. Similarly, Downey and collaborators (2005) find that schools accelerate learning and neutralize students' socioeconomic status initial disadvantages. Consequently, future research about Hispanic students' educational outcomes should include several school factors in order to portray a holistic representation of Hispanic students' educational experiences. Variables such as school resources, school minority representations, teacher characteristics, language programs should be included as independent variables.

Another recommendation for future research is about language programs in schools and effects of bilingualism on educational outcomes. Language programs for non-English speakers have been a main topic of concern among policy makers, researchers and the general public. Proponents of bilingual education argue that these programs increase the acquisition of relevant abilities for students' future, decrease the learning gap between majority and minority students, and reinforce cultural and linguistic

diversity (Krashen 1999; Cummins 2000). In contrast, proponents of English-only programs argue that the previous programs have negative impacts on students' lives by restricting learning opportunities, increasing their likelihood of dropping out of school (Murr, 1998) and decreasing their wage potential in the labor market (Porter 2001). The ECLS-K study also gathers important information about characteristics of language programs; including language of instruction, amount of instructional time given in English and Spanish, type of ESL programs, teacher qualification, among others. Based on this information, types of language programs can be identified to evaluate their effects over time.

To study the effect of Bilingualism on educational outcomes, a deeper analysis of the Cuban sample can reveal important insights. As this research has shown, close to 70% of Cuban students live in homes where a language other than English is spoken. Also, these students are more likely to be English proficient; only 20% of Cuban students are non-proficient in English. These two findings suggest that Cuban students are more likely to be bilingual. Further, this research has shown the importance of English ability for explaining Cuban students' educational outcomes. English ability reduces the White – Cuban students' math gap by more than 50% at kindergarten entry, increases the Cuban students' educational advantage during kindergarten, and explains their higher growth rate from first to third grade.

Hispanics' well being and integration into the U.S. society are key issues of analysis. Currently, Hispanics are the largest minority group and their presence will continue to increase in the future. However, Hispanics' possibilities of upward mobility are restrained because of their high poverty rates and low educational performance. This

research provides a way of exploring Hispanic students' educational experiences in their early school years in order to develop interventions that will address these social disadvantages. Addressing the issues presented in this study will contribute to reducing racial and ethnic inequality in the U.S.

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Appendix A: ECLS-K variables

Table A1. ECLS-K variables used to create variables for this Study

Study Variables	ECLS-K variables
Dependent variables	
Math scores w1, w2, w3, w4, w5	c1r2mscl, c2r2mscl, c3r2mscl, c4r2mscl, c5r2mscl
Time variables	
During kindergarten	u2schbdd, u2schbmm, u2schbyy, u2schemm, u2schedd, u2scheyy, c1asmtmm, c1asmtdd, c1asmtyy, c2asmtmm, c2asmtdd, c2asmtyy
During the summer	u2schemm, u2schedd, u2scheyy, u4schbmm, u4schbdd, u4schbyy
During first grade	u4schbmm, u4schbdd, u4schbyy, c3asmtmm, c3asmtdd, c3asmtyy, c4asmtmm, c4asmtdd, c4asmtyy
During third grade	u4schbmm, u4schbdd, u4schbyy, c5asmtmm, c5asmtdd, c5asmtyy
Main variables of analysis	
SES	sesk, sesf, ses3
Parents Maximum Level of Education	wkpared, wfpared
Hispanic students country of origin	P2cntryb, p4cbirth, p4momcob, p4dadcob, p5momcob, p5dadcob, p4hispgp, p4hispbd
Hispanic students generational status	P2cntryb, p4cbirth, p4momcob, p4dadcob, p1hmage, p1hdage, p4hmage, p4hdage, p4mageus, p4dageus, p2cntryb, p4cbirth, p4momcob, p4dadcob, p5momcob, p5dadcob
Hispanic students' English ability	cpsolds, c1sctot, c2sctot, c3sctot, c4sctot
Hispanic students' home language	c1screen, c2screen, c3screen, c4screen c1sctot, c2sctot, c3sctot, c4sctot, cpsolds
Control Variables	
Age at kindergarten entry	u2schbdd, u2schbmm, u2schbyy, dobdd, dobmm, dobyy
Kindergarten status (first time, second time kindergartener or status unknown)	p1firkdg (from kinder, first and third grade)
School moving status (never move schools between k-3rd, move at least once)	s1_id, s2_id, s3_id, s4_id, s5_id

Appendix B: Descriptive Statistics

Table B1. Descriptive Statistics main Variables by Race / Ethnicity, Country of Origin and Generational Status: SES

	N	Mean	Standard Error	95% Conf. Interval [+ -]	
Wht gen 3	7531	0.201	0.008	0.185	0.217
Blk gen 3	1552	-0.438	0.017	-0.471	-0.406
Hsp total	2272	-0.458	0.014	-0.486	-0.430
Mexican	1479	-0.575	0.016	-0.607	-0.544
Gen 1	114	-0.925	0.040	-1.005	-0.845
Gen 2	913	-0.735	0.018	-0.770	-0.701
Gen 3	439	-0.133	0.029	-0.190	-0.075
Puerto Rican	197	-0.296	0.044	-0.382	-0.210
Gen 1	11	-0.363	0.265	-0.954	0.228
Gen 2	86	-0.428	0.063	-0.554	-0.303
Gen 3	99	-0.175	0.058	-0.290	-0.061
Cuba	82	0.145	0.093	-0.039	0.330
Gen 1	7	-0.009	0.180	-0.449	0.431
Gen 2	54	0.140	0.106	-0.073	0.352
Gen 3	19	0.234	0.234	-0.259	0.726
South America	126	0.005	0.066	-0.125	0.136
Gen 1	17	0.140	-0.373	-0.670	-0.077
Gen 2	109	0.072	0.073	-0.069	0.215
Central America	229	-0.488	0.047	-0.581	-0.396
Gen 1	15	-0.640	-0.211	-1.069	0.200
Gen 2	214	-0.477	0.048	-0.572	-0.382
Other Hsp	159	-0.030	0.055	-0.138	0.078
Gen 1	9	0.231	-0.020	-0.553	0.514
Gen 2	63	0.051	0.085	-0.119	0.221
Gen 3	83	-0.052	0.075	-0.202	0.097

Appendix C: Statistical Models

Table C1. Confidence Intervals for Estimated Math Score Gaps at Kindergarten Entry by Country of Origin and Generational Status

	+	**Mean**	-
Black	-0.57	-0.62	-0.68
Mexican	-0.75	-0.81	-0.87
Gen 1	-0.99	-1.11	-1.22
Gen 2	-0.87	-0.93	-0.99
Gen 3+	-0.39	-0.49	-0.59
Cuban	-0.25	-0.45	-0.65
Gen 1	-0.43	-0.92	-1.40
Gen 2	-0.28	-0.54	-0.80
Gen 3+	0.73	0.04	-0.65
Pto Rican	-0.33	-0.59	-0.85
Gen 1	-0.27	-0.93	-1.60
Gen 2	-0.49	-0.69	-0.89
Gen 3+	-0.25	-0.46	-0.67
South A.	-0.11	-0.33	-0.55
Gen 1	-0.64	-0.99	-1.34
Gen 2	0.01	-0.21	-0.43
Central A.	-0.69	-0.81	-0.93
Gen 1	-0.36	-0.75	-1.14
Gen 2	-0.70	-0.82	-0.93
Other Hsp	0.06	-0.22	-0.49
Gen 1	0.02	-0.52	-1.06
Gen 2	0.03	-0.24	-0.51
Gen 3+	0.04	-0.18	-0.41

Note 1: measured in pooled standard deviation units
Note 2: formula, $\tilde{Y}$ +- [s.e. ($\tilde{Y}$) * 1.96]

Table C2. Math Learning Trajectories Models including, Race – Ethnicity and Generational Status

	Model 1	**Model 2**
	Ethnicity	**Gen St**
Initial Status		
Intercept	20.688 ***	20.685 ***
	0.120	0.120
Black	-4.681 ***	-4.685 ***
	0.200	0.200
Hispanics	-5.350 ***	
	0.186	
gen 1		-7.658 ***
		0.434
gen 2		-6.023 ***
		0.208
gen 3+		-3.209 ***
		0.333
Second time K	-1.870 ***	-1.774 ***
	0.479	0.478
K status missing	-1.160 ***	-1.120 ***
	0.326	0.327
Change school	-0.720 ***	-0.737 ***
	0.181	0.181
Time Oc	0.501 ***	0.497 ***
	0.019	0.019
Kindergarten slope		
Intercept	1.780 ***	1.780 ***
	0.014	0.014
Black	-0.381 ***	-0.381 ***
	0.028	0.028
Hispanics	-0.236 ***	
	0.025	
gen 1		-0.335 ***
		0.076
gen 2		-0.285 ***
		0.029
gen 3+		-0.095 *
		0.041
Second time K	-0.185 ***	-0.182 ***
	0.051	0.051
K status missing	-0.051	-0.051
	0.044	0.044
Change school	-0.030	-0.031
	0.023	0.023

	Model 1		Model 2	
	Ethnicity		**Gen St**	
Summer slope				
Intercept	0.591	***	0.591	***
	0.066		0.066	
Black	-0.005		-0.006	
	0.126		0.126	
Hispanics	-0.025			
	0.117			
gen 1			-0.167	
			0.401	
gen 2			0.061	
			0.139	
gen 3+			-0.189	
			0.195	
Second time K	-0.224		-0.220	
	0.216		0.216	
K status missing	-0.227	+	-0.224	
	0.137		0.137	
Change school	0.077		0.078	
	0.106		0.106	
First grade slope				
Intercept	2.554	***	2.554	***
	0.024		0.024	
Black	-0.436	***	-0.436	***
	0.045		0.045	
Hispanics	-0.214	***		
	0.041			
gen 1			-0.258	+
			0.138	
gen 2			-0.254	***
			0.049	
gen 3+			-0.104	
			0.071	
Second time K	-0.228	**	-0.226	**
	0.079		0.079	
K status dummy	0.048		0.049	
	0.051		0.051	
Change school	-0.081	*	-0.083	*
	0.038		0.038	

	Model 1		Model 2	
	Ethnicity		**Gen St**	
Between first and third grade Slope				
Intercept	1.212	***	1.212	***
	0.007		0.007	
Black	-0.146	***	-0.146	***
	0.014		0.014	
Hispanics	-0.002			
	0.013			
gen 1			0.049	
			0.040	
gen 2			-0.008	
			0.016	
gen 3+			-0.003	
			0.023	
Second time K	-0.099	***	-0.100	***
	0.027		0.027	
K status missing	-0.023		-0.024	
	0.015		0.015	
Change school	0.004		0.004	
	0.012		0.012	

Note: p-value<=0.001 ***, p-value<=0.01 **, p-value<=0.05 *, p-value<=0.1 +; White students reference group

Table C3. Math Learning Trajectories Models including Hispanic students' country of origin, generational status, English Ability and SES

	Model 3		Model 4		Model 5		Model 6		Model 7	
	country of origin		gen +		ses +		lang +		lang + ses +	
Initial Status										
Intercept	20.684	***	20.682	***	19.611	***	20.676	***	19.618	***
	0.120		-0.120		0.110		0.120		0.110	
Black	-4.685	***	-4.688	***	-1.988	***	-4.695	***	-2.017	***
	0.200		-0.200		0.200		0.199		0.201	
Mexican	-6.104	***	-6.988	***	-3.001	***	-4.346	***	-1.988	***
	0.206		-0.227		-2.405		0.371		0.359	
Cuban	-3.349	***	-4.040	***	-3.820	***	-2.361	*	-2.959	**
	0.950		-0.999		0.893		0.996		0.928	
Puerto Rican	-4.430	***	-5.214	***	-2.405	***	-3.986	***	-1.833	*
	0.563		-0.768		0.732		0.771		0.752	
South American	-2.461	**	-1.612	+	-1.201		-0.067		-0.419	
	0.776		-0.844		0.775		0.847		0.802	
Central American	-6.078	***	-6.136	***	-3.311	***	-3.820	***	-2.344	***
	0.440		-0.455		0.408		0.524		0.485	
Other Hispanic	-1.642	*	-1.804	+	-0.992		-0.935		-0.600	
	0.653		-1.051		0.998		1.046		1.011	
Mexican G1			-1.330	**	-0.604		-0.503		-0.363	
			0.484		0.486		0.502		0.493	
Mexican G3			3.326	***	0.800	*	1.012	*	-0.063	
			0.417		0.402		0.474		0.456	
Puerto Rican G1			-1.811		-1.897		-1.257		-1.663	
			2.663		2.840		2.657		2.868	
Puerto Rican G3			1.760		0.667		0.882		0.258	
			1.110		1.036		1.087		1.035	
Cuban G1			-2.866		-2.522		-1.606		-2.150	
			2.110		2.039		2.090		2.049	
Cuban G3			4.348		3.667		4.117		3.486	
			2.820		2.311		2.631		2.264	
South American G1			-5.851	***	-4.466	**	-4.408	**	-4.025	*
			1.582		1.568		1.532		1.567	
Central American G1			0.527		0.800		1.185		0.944	
			1.554		1.321		1.596		0.944	
Other Hispanic G1			-2.103		-2.382		-0.895		-1.719	
			2.309		2.318		2.139		-1.719	
Other Hispanic G3			0.440		0.773		-0.144		0.530	
			1.354		1.296		1.339		0.530	

(continuation)

	Model 3		Model 4		Model 5		Model 6		Model 7	
	country of origin		gen +		ses +		lang +		lang + ses +	
Hsp OLDS need							-3.188	***	-1.341	***
							0.350		0.341	
Hsp W1 OLDS (stdzd)							1.080	***	0.201	
							0.185		0.183	
SES					4.177	***			4.135	***
					0.124				0.127	
Hsp OLDS missing							1.240		1.770	
							1.878		1.774	
SES missing					2.022				1.996	
					1.372		()		1.374	
Second time K	-1.886	***	-1.803	***	-1.338	**	-1.729	***	-1.302	**
	0.475		-0.474		0.442		0.472		0.442	
Status missing	-1.149	***	-1.113	***	-0.782	*	-1.097	***	-0.790	*
	0.324		-0.325		0.321		0.326		0.322	
Change school	-0.714	***	-0.735	***	-0.627	***	-0.738	***	-0.628	***
	0.180		0.180		0.169		0.180		0.169	
Age at kindergarten entr	0.497	***	0.493	***	0.508	***	0.486	***	0.504	***
	0.019		0.019		0.018		0.019		0.018	

(continuation)

	Model 1		Model2		Model 3		Model 4		Model 5	
	country of origin		**gen +**		**ses +**		**lang +**		**lang + ses +**	
Kinder slope										
Intercept	1.779	***	1.779	***	1.741	***	1.779	***	1.744	***
	0.014		0.014		0.014		0.014		0.014	
Black	-0.381	***	-0.381	***	-0.285	***	-0.381	***	-0.291	***
	0.028		0.028		0.029		0.028		0.029	
Mexican	-0.276	***	-0.366	***	-0.224	***	-0.163	**	-0.080	
	0.029		0.035		0.037		0.053		0.053	
Cuban	0.330	**	0.396	***	0.405	***	0.451	***	0.431	***
	0.109		0.113		0.107		0.118		0.114	
Puerto Rican	-0.336	***	-0.291	**	-0.194	+	-0.248	*	-0.177	+
	0.063		0.104		0.103		0.107		0.105	
South American	-0.116		-0.153		-0.138		-0.092		-0.106	
	0.087		0.096		0.096		0.101		0.100	
Central American	-0.277	***	-0.267	***	-0.168	*	-0.111		-0.062	
	0.068		0.071		0.072		0.083		0.083	
Other Hispanic	-0.065		0.037		0.067		0.082		0.095	
	0.078		0.118		0.116		0.120		0.118	
Mexican G1			-0.043		-0.017		0.035		0.044	
			0.097		0.096		0.097		0.097	
Mexican G3			0.318	***	0.228	***	0.128	+	0.087	
			0.058		0.058		0.066		0.066	
Puerto Rican G1			-0.481	+	-0.464	+	-0.418		-0.417	
			0.279		0.269		0.274		0.269	
Puerto Rican G3			-0.030		-0.065		-0.063		-0.083	
			0.128		0.127		0.129		0.128	
Cuban G1			-0.100		-0.082		0.047		0.038	
			0.287		0.287		0.301		0.299	
Cuban G3			-0.255		-0.281		-0.233		-0.254	
			0.330		0.335		0.333		0.338	
South American G1			0.268		0.305		0.409	*	0.416	*
			0.217		0.205		0.209		0.200	
Central American G1			-0.110		-0.069		-0.026		0.001	
			0.207		0.207		0.199		0.202	
Other Hispanic G1			-0.166		-0.177		-0.068		-0.125	
			0.618		0.608		0.603		0.600	
Other Hispanic G3			-0.166		-0.158		-0.208		-0.188	
			0.152		0.149		0.153		0.150	

(continuation)

	Model 1		Model2		Model 3		Model 4		Model 5	
	country of origin		gen +		ses +		lang +		lang + ses +	
Hsp OLDS need							-0.206	***	-0.149	**
							0.051		0.051	
Hsp W1 OLDS (stdzd)							0.174	***	0.147	***
							0.029		0.029	
SES					0.148	***			0.138	***
					0.015				0.016	
Hsp OLDS missing							-0.341		-0.365	+
							0.223		0.214	
SES missing					-0.133				-0.157	
					0.216				0.216	
Second time K	-0.185	***	-0.184	***	-0.164	**	-0.186	***	-0.168	***
	0.051		0.051		0.051		0.051		0.051	
Status missing	-0.049		-0.046		-0.031		-0.039		-0.024	
	0.044		0.043		0.043		0.044		0.044	
Change school	-0.029		-0.030		-0.027		-0.031		-0.028	
	0.023		0.023		0.023		0.023		0.023	

(continuation)

	Model 3		Model 4		Model 5		Model 6		Model 7	
	country of origin		**gen +**		**ses +**		**lang +**		**lang + ses +**	
Kinder slope										
Intercept	1.779	***	1.779	***	1.741	***	1.779	***	1.744	***
	0.014		0.014		0.014		0.014		0.014	
Black	-0.381	***	-0.381	***	-0.285	***	-0.381	***	-0.291	***
	0.028		0.028		0.029		0.028		0.029	
Mexican	-0.276	***	-0.366	***	-0.224	***	-0.163	**	-0.080	
	0.029		0.035		0.037		0.053		0.053	
Cuban	0.330	**	0.396	***	0.405	***	0.451	***	0.431	***
	0.109		0.113		0.107		0.118		0.114	
Puerto Rican	-0.336	***	-0.291	**	-0.194	+	-0.248	*	-0.177	+
	0.063		0.104		0.103		0.107		0.105	
South American	-0.116		-0.153		-0.138		-0.092		-0.106	
	0.087		0.096		0.096		0.101		0.100	
Central American	-0.277	***	-0.267	***	-0.168	*	-0.111		-0.062	
	0.068		0.071		0.072		0.083		0.083	
Other Hispanic	-0.065		0.037		0.067		0.082		0.095	
	0.078		0.118		0.116		0.120		0.118	
Mexican G1			-0.043		-0.017		0.035		0.044	
			0.097		0.096		0.097		0.097	
Mexican G3			0.318	***	0.228	***	0.128	+	0.087	
			0.058		0.058		0.066		0.066	
Puerto Rican G1			-0.481	+	-0.464	+	-0.418		-0.417	
			0.279		0.269		0.274		0.269	
Puerto Rican G3			-0.030		-0.065		-0.063		-0.083	
			0.128		0.127		0.129		0.128	
Cuban G1			-0.100		-0.082		0.047		0.038	
			0.287		0.287		0.301		0.299	
Cuban G3			-0.255		-0.281		-0.233		-0.254	
			0.330		0.335		0.333		0.338	
South American G1			0.268		0.305		0.409	*	0.416	*
			0.217		0.205		0.209		0.200	
Central American G1			-0.110		-0.069		-0.026		0.001	
			0.207		0.207		0.199		0.202	
Other Hispanic G1			-0.166		-0.177		-0.068		-0.125	
			0.618		0.608		0.603		0.600	
Other Hispanic G3			-0.166		-0.158		-0.208		-0.188	
			0.152		0.149		0.153		0.150	

	Model 3		Model 4		Model 5		Model 6		Model 7	
	country of origin		**gen +**		**ses +**		**lang +**		**lang + ses +**	
Hsp OLDS need							-0.206	***	-0.149	**
							0.051		0.051	
Hsp W1 OLDS (stdzd)							0.174	***	0.147	***
							0.029		0.029	
SES					0.148	***			0.138	***
					0.015				0.016	
Hsp OLDS missing							-0.341		-0.365	+
							0.223		0.214	
SES missing					-0.133				-0.157	
					0.216				0.216	
Second time K	-0.185	***	-0.184	***	-0.164	**	-0.186	***	-0.168	***
	0.051		0.051		0.051		0.051		0.051	
Status missing	-0.049		-0.046		-0.031		-0.039		-0.024	
	0.044		0.043		0.043		0.044		0.044	
Change school	-0.029		-0.030		-0.027		-0.031		-0.028	
	0.023		0.023		0.023		0.023		0.023	

(continuation)

(continuation)

	Model 3		Model 4		Model 5		Model 6		Model 7	
	country of origin		gen +		ses +		lang +		lang + ses +	
Summer slope										
Intercept	0.590	***	0.588	***	0.542	***	0.586	***	0.539	***
	0.066		0.066		0.065		0.066		0.065	
Black	-0.006		-0.008		0.107		-0.011		0.106	
	0.126		0.126		0.130		0.126		0.130	
Mexican	-0.024		0.074		0.249		0.435	+	0.524	
	0.133		0.158		0.166		0.254		0.254	
Cuban	-0.214		0.279		0.271		0.789		0.737	
	0.496		0.518		0.526		0.561		0.566	
Puerto Rican	-0.356		-0.530		-0.417		-0.199		-0.119	
	0.320		0.462		0.465		0.459		0.464	
South American	-0.100		-0.211		-0.220		0.255		0.197	
	0.486		0.513		0.514		0.546		0.545	
Central American	-0.209		-0.006		0.080		0.370		0.391	
	0.437		0.474		0.473		0.525		0.522	
Other Hispanic	0.738	+	0.744		0.761		0.956		0.945	
	0.402		0.649		0.640		0.645		0.637	
Mexican G1			0.091		0.112		0.151		0.140	
			0.531		0.529		0.533		0.534	
Mexican G3			-0.362		-0.480	+	-0.662	*	-0.700	*
			0.265		0.265		0.309		0.308	
Puerto Rican G1			0.760		0.771		0.841		0.829	
			0.660		0.646		0.658		0.648	
Puerto Rican G3			0.248		0.183		-0.033		-0.071	
			0.650		0.652		0.642		0.645	
Cuban G1			-1.239		-1.469		-1.534		-1.765	
			1.335		1.276		1.171		1.156	
Cuban G3			-1.818		-1.755		-2.059		-1.991	
			1.333		1.349		1.382		1.397	
South American G1			1.958	+	1.965	+	1.845		1.803	
			1.170		1.168		1.146		1.142	
Central American G1			-1.526		-1.581		-1.493		-1.578	
			1.046		1.063		1.020		1.040	
Other Hispanic G1			-2.162		-2.195		-2.217		-2.283	
			2.141		2.104		2.211		2.141	
Other Hispanic G3			0.134		0.119		-0.032		-0.019	
			0.827		0.821		0.816		0.812	

(continuation)

	Model 3	Model 4	Model 5	Model 6	Model 7
	country of origin	**gen +**	**ses +**	**lang +**	**lang + ses +**
Hsp OLDS need				-0.516 *	-0.411
				0.255	0.257
Hsp W1 OLDS (stdzd)				-0.134	-0.184
				0.145	0.147
SES			0.196 **		0.199 **
			0.072		0.073
Hsp OLDS missing				0.017	0.036
				0.443	0.440
SES missing			0.755		0.734
			0.885		0.886
Second time K	-0.236	-0.204	-0.170	-0.190	-0.155
	0.215	0.215	0.215	0.215	0.215
K Status missing	-0.226	-0.214	-0.213	-0.199	-0.198
	0.138	0.138	0.139	0.141	0.142
Change school	0.085	0.081	0.089	0.083	0.091
	0.106	0.107	0.107	0.107	0.107

(continuation)

	Model 3 country of origin		Model 4 gen +		Model 5 ses +		Model 6 lang +		Model 7 lang + ses +	
First grade slope										
Intercept	2.554	***	2.554	***	2.522	***	2.556	***	2.525	***
	0.024		0.024		0.024		0.024		0.024	
Black	-0.435	***	-0.436	***	-0.353	***	-0.434	***	-0.353	***
	0.045		0.045		0.047		0.045		0.047	
Mexican	-0.170	***	-0.201	***	-0.085		-0.216	*	-0.141	
	0.047		0.056		0.060		0.090		0.091	
Cuban	-0.255		-0.486	*	-0.469	*	-0.580	**	-0.587	**
	0.179		0.207		0.207		0.217		0.217	
Puerto Rican	-0.289	*	-0.225		-0.138		-0.284		-0.215	
	0.124		0.172		0.172		0.174		0.174	
South American	-0.085		0.007		0.029		-0.089		-0.087	
	0.169		0.178		0.178		0.189		0.188	
Central American	-0.294	*	-0.387	**	-0.297	*	-0.427	**	-0.372	*
	0.135		0.139		0.138		0.159		0.158	
Other Hispanic	-0.483	***	-0.755	***	-0.733	***	-0.775	***	-0.767	***
	0.139		0.223		0.222		0.224		0.223	
Mexican G1			-0.110		-0.088		-0.092		-0.082	
			0.172		0.172		0.174		0.174	
Mexican G3			0.143		0.070		0.150		0.113	
			0.096		0.096		0.111		0.111	
Puerto Rican G1			-0.558		-0.562		-0.581		-0.592	
			0.402		0.392		0.411		0.401	
Puerto Rican G3			-0.056		-0.083		0.003		-0.012	
			0.248		0.247		0.246		0.245	
Cuban G1			0.159		0.272		0.323		0.400	
			0.396		0.378		0.375		0.365	
Cuban G3			0.988	*	0.952	*	1.048	*	1.013	*
			0.413		0.405		0.423		0.415	
South American G1			-0.954	*	-0.893	*	-0.841	+	-0.804	+
			0.447		0.436		0.433		0.423	
Central American G1			0.990	+	1.045	*	1.045	*	1.084	*
			0.516		0.508		0.505		0.497	
Other Hispanic G1			0.512		0.519		0.591		0.578	
			0.530		0.527		0.526		0.523	
Other Hispanic G3			0.456		0.479	+	0.474	+	0.506	+
			0.285		0.283		0.283		0.282	

(continuation)

	Model 3		Model 4		Model 5		Model 6		Model 7	
	country of origin		**gen +**		**ses +**		**lang +**		**lang + ses +**	
Hsp OLDS need							0.009		0.055	
							0.088		0.088	
Hsp W1 OLDS (stdzd)							0.092	+	0.072	
							0.048		0.049	
SES					0.120	***			0.118	***
					0.026				0.026	
Hsp OLDS missing							0.436	*	0.433	*
							0.185		0.185	
SES missing					-0.486				-0.466	
					0.308				0.308	
Second time K	-0.220	**	-0.228	**	-0.216	**	-0.229	**	-0.218	**
	0.079		0.079		0.079		0.079		0.079	
K status missing	0.046		0.043		0.069		0.019		0.044	
	0.051		0.051		0.052		0.051		0.052	
Change school	-0.082	**	-0.081	*	-0.080	*	-0.081	*	-0.080	*
	0.038		0.039		0.039		0.039		0.039	

(continuation)

	Model 3		Model 4		Model 5		Model 6		Model 7	
	country of origin		gen +		ses +		lang +		lang + ses +	
Between first and third grade Slope										
Intercept	1.212	***	1.212	***	1.200	***	1.212	***	1.201	***
	0.007		0.007		0.007		0.007		0.007	
Black	-0.145	***	-0.145	***	-0.116	***	-0.146	***	-0.119	***
	0.014		0.014		0.015		0.014		0.015	
Mexican	-0.047	**	-0.053	**	-0.008		0.012		0.036	
	0.016		0.020		0.021		0.030		0.031	
Cuban	0.104	+	0.056		0.060		0.055		0.049	
	0.055		0.066		0.065		0.071		0.070	
Puerto Rican	0.094	*	0.000		0.030		0.005		0.027	
	0.038		0.052		0.051		0.053		0.052	
South American	0.058		0.035		0.037		0.042		0.035	
	0.048		0.050		0.051		0.054		0.055	
Central American	0.085	*	0.094	**	0.127	***	0.137	**	0.152	***
	0.035		0.036		0.037		0.043		0.043	
Other Hispanic	0.063		0.145	+	0.156	+	0.152	+	0.157	+
	0.044		0.081		0.080		0.081		0.080	
Mexican G1			0.015		0.018		0.053		0.049	
			0.052		0.053		0.051		0.051	
Mexican G3			0.014		-0.014		-0.051		-0.061	
			0.033		0.033		0.038		0.038	
Puerto Rican G1			0.272	*	0.273	*	0.287	*	0.284	*
			0.121		0.122		0.124		0.125	
Puerto Rican G3			0.157	*	0.145	+	0.149	+	0.144	+
			0.078		0.077		0.078		0.077	
Cuban G1			0.481	*	0.464	*	0.536	*	0.512	*
			0.211		0.210		0.212		0.212	
Cuban G3			-0.018		-0.021		-0.001		-0.004	
			0.103		0.107		0.107		0.111	
South American G1			0.169		0.176		0.216		0.213	
			0.141		0.136		0.135		0.131	
Central American G1			-0.115		-0.121		-0.078		-0.089	
			0.102		0.104		0.109		0.111	
Other Hispanic G1			0.143		0.142		0.178		0.166	
			0.142		0.141		0.142		0.141	
Other Hispanic G3			-0.159	+	-0.154		-0.171	+	-0.162	+
			0.095		0.095		0.095		0.095	

(continuation)

	Model 3		Model 4		Model 5		Model 6		Model 7	
	country of origin		**gen +**		**ses +**		**lang +**		**lang + ses +**	
Hsp OLDS need							-0.055	+	-0.035	
							0.029		0.029	
Hsp W1 OLDS (stdzd)							0.086	***	0.077	***
							0.017		0.017	
SES					0.046	***			0.043	***
					0.007				0.007	
Hsp OLDS missing							-0.121	+	-0.116	+
							0.064		0.064	
Hsp SES missing					0.165	*			0.153	*
					0.078				0.077	
Second time K	-0.103	***	-0.102	***	-0.095	***	-0.102	***	-0.096	***
	0.027		0.027		0.027		0.027		0.027	
K status missing	-0.022		-0.023		-0.025		-0.016		-0.018	
	0.015		0.015		0.016		0.015		0.016	
Change school	0.003		0.003		0.004		0.003		0.004	
	0.012		0.012		0.012		0.012		0.012	

Note: p-value<=0.001 ***, p-value<=0.01 **, p-value<=0.05 *, p-value<=0.1 +; White students reference group; standard errors bellow estimated coefficients

Table C4. Confidence Intervals for Estimated Math Growth Rate Gaps between Kindergarten and Third Grade by Country of Origin and Generational Status

	During Kindergarten				**During First Grade**				**From First to Third Grades**		
	+	**Mean**	-		+	**Mean**	-		+	**Mean**	-
Black	-0.39	-0.46	-0.52	Black	-0.32	-0.40	-0.48	Black	-0.27	-0.33	-0.39
Mexican	-0.25	-0.33	-0.41	Mexican	-0.06	-0.16	-0.26	Mexican	-0.02	-0.05	-0.20
Gen 1	-0.27	-0.49	-0.71	Gen 1	0.01	-0.29	-0.59	Gen 1	0.13	-0.09	-0.31
Gen 2	-0.36	-0.44	-0.52	Gen 2	-0.08	-0.19	-0.29	Gen 2	-0.03	-0.12	-0.21
Gen 3+	0.06	-0.06	-0.17	Gen 3+	0.10	-0.05	-0.20	Gen 3+	0.04	-0.09	-0.21
Cuban	0.64	0.40	0.15	Cuban	0.08	-0.24	-0.55	Cuban	0.47	0.10	0.01
Gen 1	0.98	0.36	-0.27	Gen 1	0.31	-0.30	-0.92	Gen 1	2.12	1.23	0.33
Gen 2	0.74	0.48	0.21	Gen 2	-0.07	-0.45	-0.82	Gen 2	0.42	0.14	-0.17
Gen 3+	0.90	0.17	-0.56	Gen 3+	1.11	0.46	-0.18	Gen 3+	0.48	0.09	-0.23
Pto Rican	-0.14	-0.40	-0.67	Pto Rican	0.11	-0.27	-0.64	Pto Rican	0.51	0.09	-0.08
Gen 1	-0.32	-0.93	-0.32	Gen 1	-0.06	-0.72	-1.38	Gen 1	1.11	0.62	0.13
Gen 2	-0.10	-0.35	-0.10	Gen 2	0.10	-0.21	-0.52	Gen 2	0.23	0.00	-0.23
Gen 3+	-0.20	-0.39	-0.20	Gen 3+	0.07	-0.26	-0.59	Gen 3+	0.62	0.36	0.09
South A.	0.09	-0.14	-0.37	South A.	0.24	-0.08	-0.40	South A.	0.36	0.06	-0.09
Gen 1	0.60	0.14	0.60	Gen 1	-0.13	-0.88	-1.62	Gen 1	1.05	0.46	-0.13
Gen 2	0.04	-0.18	0.04	Gen 2	0.33	0.01	-0.32	Gen 2	0.30	0.08	-0.14
Central A.	-0.05	-0.33	-0.16	Central A.	-0.02	-0.27	-0.52	Central A	0.36	0.09	0.03
Gen 1	0.01	-0.45	-0.91	Gen 1	1.46	0.56	-0.35	Gen 1	0.38	-0.05	-0.47
Gen 2	-0.15	-0.32	-0.49	Gen 2	-0.11	-0.36	-0.61	Gen 2	0.38	0.21	0.05
Other Hsp	0.20	-0.08	-0.36	Other Hsp	-0.04	-0.45	-0.85	Other Hsp	0.50	0.06	-0.22
Gen 1	1.27	-0.16	1.27	Gen 1	0.65	-0.22	-1.10	Gen 1	1.18	0.65	0.13
Gen 2	0.32	0.04	0.32	Gen 2	-0.29	-0.70	-1.10	Gen 2	0.69	0.33	-0.03
Gen 3+	0.08	-0.16	-0.39	Gen 3+	0.06	-0.28	-0.60	Gen 3+	0.20	-0.03	-0.26

Note 1: measured in pooled standard deviation units

Note 2: formula, $\tilde{Y}$ +- [s.e. ($\tilde{Y}$) * 1.96]

Vita

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Education

Doctor of Philosophy in Educational Theory and Policy, and Comparative and International Education (Dual Title Degree). Minor in Demography.
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1986-1996 Pontificia Universidad Católica del Perú. Lima, Perú.

Research Experience

2005	Consultant- Researcher. The Arizona State University. National Task Force on Early Childhood Education for Hispanics
2000 – 2005	Research assistant. The Pennsylvania State University. Department of Education Policy Studies. Supervisor: Dr. Sean Reardon
2004 – 2005	Research collaboration with Dr. Suet-Ling Pong. The Pennsylvania State University.
2004 – 2005	Research collaboration with Dr. Myriam Espinosa-Dulanto. The Pennsylvania State University. (Fry 2003) Project:
2000 – 2002	Research collaboration with Dr. David Baker. The Pennsylvania State University. Projects:
2000 – 2001	Research collaboration with Dr. David Post. The Pennsylvania State University.
2000 – 1997	Consultant – Researcher. Ministry of Education of Perú

Award and Scholarships

2005 – 2004	Graduate Research Assistantship, The Pennsylvania State University.
2004 – 2003	American Educational Research Association (AERA) Dissertation Award.
2004 – 2003	Miriam Gray Scholarship, College of Education, The Pennsylvania State University.
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2002	PHI DELTA KAPPA. Kozak Fellowship Award.
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1998	UNESCO - Laboratorio Latinoamericano de Evaluación de la Calidad de la Educación (LLACE) Travel and course grant. Santiago de Chile