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The Effect of Immigrant Composition on Student Achievement: Evidence from New York City

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ABSTRACT

The Effect of Immigrant Composition on Student Achievement

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There has been a large body of recent literature focused on the effects of school composition on student outcomes. These studies have focused on peer group characteristics such as achievement, gender composition, ethnic and racial composition, and socioeconomic composition. This area of research has been commonly called "peer effects." A relatively unexplored area of peer effects research involves the effect of immigrant children on their schoolmates. Because of the heterogeneity between immigrant groups, this study focuses on East Asian and Dominican immigrant children. As these two groups are on opposite sides of the socioeconomic spectrum, comparing results of the two analyses should provide a reasonably complete picture of immigrant composition effects.

The data for this study come from New York City. New York City is arguably the ideal place to study immigration. Immigrants from though out the world attend New York City schools. While New York remains an outlier, it is quickly becoming the norm. In recent decades, various parts of the country that have not experienced large waves of immigration are doing so now. The experience of New York has potential to inform the larger debate on the cost of providing public services to immigrants. If immigrant children have negative effects on their schoolmates, they will increase the cost of education. On the

other hand, if they have positive effects, they can serve as a positive externality and reduce the cost of public education.

The estimation of peer effects is a daunting challenge. One of the most challenging of these problems is called the selection problem. The selection problem occurs because immigrant children are not randomly assigned to classes, schools, or neighborhoods. To overcome this problem, this study uses credibly exogenous variation that occurs as a student progresses with a cohort within a school.

The results suggest that both East Asian and Dominican immigrant composition has a negative and significant effect on student achievement. This effect occurs for all subgroups and for both English-Language Arts and mathematics. Surprisingly, this immigrant composition effect is not driven by ELL status.

This coefficient can be considered something of a reduced-form measure of immigrant composition effect. Regressions that control for other country variables suggest that schools with growth in East Asian and Dominican immigrant composition also have growth in other forms of immigrant composition. When including these other variables, the results suggest a cultural effect. East Asian immigrants have positive effects in mathematics while Dominican immigrants continue to have negative effects, though at smaller magnitudes. These results suggest that culture matters.

As a matter of policy though, given that immigrants move together, it is not practical to separate specific ethnic immigrant effects. Rather policy recommendation should look at the "reduced form" effects. Potential policy recommendations include additional resources for immigrant education such as English as a second language and civics classes or newcomer schools. Ethnographic research on how immigrant children

interact with their classmates and schools could also be valuable in deciphering the exact mechanism behind this negative effect.

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ACKNOWLEDGMENTS

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Finally, I would like to state that my main research area has been education policy. This is not an accident. I would like to acknowledge the role my family has played in my appreciation and belief in the value and transformative role of education. My success is their success.

Chapter 1

INTRODUCTION

A large body of recent literature has focused on the effects of school composition on student outcomes. These studies have focused on school peer group characteristics as achievement (e.g. Hanushek, Kain, Markman, & Rivkin, 2003; Hoxby, 2000b; Lavy, Silva, & Weinhardt, 2009), racial composition (e.g. Bifulco, Fletcher, & Ross, 2008; Hanushek, Kain, & Rivkin, 2009; Hanushek & Rivkin, 2009), gender composition (e.g. Hoxby, 2000b; Lavy & Schlosser, 2007; Proud, 2008), and socioeconomic status (e.g. Bifulco, et al., 2008; McEwan, 2003; Schneeweis & Winter-Ebmer, 2006). However, only a few studies (e.g. Friesen & Krauth, 2008; Gould, Lavy, & Paserman, 2005; Schwartz & Stiefel, 2010) have focused on the effects of immigrant composition on student performance, and none on the effect of individual ethnic groups. As this study will demonstrate, there are reasons to believe that the effect of immigrants is worthy of study.

This study can inform the more general issue of the impacts immigrants have on society. Most of the attention of the media and research has emphasized the impact of immigration on labor markets (Alsalam & Smith, 2005; Borjas, 2003; Pedace, 2006) and the cost of public services (Borjas & Hilton, 1996; R. Lee & Miller, 2000; Vernez & McCarthy, 1995). In education, attention has been paid to the cost of assimilating immigrants in public schools including the cost of English as a second language (ESL) and bilingual services. A less reported issue has been the effect of immigrant children on their schoolmates, which can also influence the cost of providing public services. If the effects

on schoolmates are positive, this would offset the cost of providing services to immigrant children. If their effects are negative however, it may increase them.

Finally, the study of immigrant composition effects has direct policy implications. While New York City remains a unique setting, it is a fast becoming the norm. Immigration in the 21st century includes growth in traditionally low immigration states as Alabama, Tennessee, and Georgia (Singer, 2009). If immigrant composition has negative effects, it may behoove school administrators to provide additional services in the form of individualized instruction or ESL services to immigrant children, even if they are performing well overall, to counteract their negative effects. However, these services are not without cost. Without additional funding any additional resources devoted to immigrant children, they may drain resources from native-born children (Betts, 1998).

An emerging consensus has suggested negative academic outcomes from immigrant composition. Lack of English language proficiency, low school quality in countries of origin or cultural differences may lead to a diversion of resources away from regular classrooms to English as a second language (ESL) classes and other special services, particularly if state compensation formulae do not fully compensate districts for additional costs. Moreover, immigrant students might have adverse effects on the classroom environment or slow down the pace of learning in classrooms because of language difficulties or cultural differences. However, the methodology and focus on two individual immigrant groups make this study unique.

Because immigrant children are a heterogeneous group, I focus on two different immigrant subgroups: East Asians, children from China, Japan, or Korea, and Dominicans. These two groups form opposite sides of the socioeconomic spectrum. Dominicans are one

of the poorest ethnic groups in the United States, with an average per-capita household income $11,065 in 1999 (Hernández & Rivera-Batiz, 2003). In contrast, East Asian households tend to be among the wealthiest and best educated of all immigrant groups (U.S. Census Bureau, 2002). There are also distinct cultural differences between these two groups. Dominican culture is composed of a complicated mix of African, Taino, and European civilizations (Howard, 2001). The countries of Korea, China, and Japan are generally considered to be Confucian cultures (Wei-ming, 1996), based on self-cultivation and sociopolitical harmony (J.-K. Lee, 2001). Results from analyses of these groups should provide insight into the effects immigrant children have on their peers.

Estimation of composition effects is fraught with challenges. One issue involves the fact that immigrant children are not randomly distributed across schools. A plausible estimate of immigrant peer effects would have to disentangle the effect of immigrant composition from differences in teacher quality and other unobserved variables correlated with the presence of immigrant children. To identify the effect of immigrant children on their classmates I control for a set of overlapping fixed effects consisting of individual, school-by-grade and grade-by-year fixed effectscorrelated with both immigrant composition and student achievement. This method means identifying immigrant composition effects through intra-student, intra-cohort variation in immigrant composition. In addition, I test a number of hypotheses to elucidate the exact mechanism behind immigrant composition effects.

The results suggest that both East Asian immigrant composition and Dominican immigrant composition are negatively associated with student achievement in both English-language arts and mathematics. Subgroup analyses suggest this effect is consistent

across subgroups, consistent with a theory of resource diversion. If immigrant children are more costly to educate, and schools and school districts are not adequately compensated for these additional costs, they may reduce the achievement of other children within a school. The results suggest English as a second language status is not behind this resource diversion mechanism. The negative effect of immigrant composition suggests that additional funding should be devoted to schools with high concentrations of immigrant children. There may also be a role for so-called newcomer schools that cater to the specific needs of immigrant students.

Regressions that control for other forms of immigrant composition, suggest that schools that have high shares of Dominican or East Asian immigrant students also tend to have high shares of other types of immigrants. Once these controls are added to the model, the effect of East Asian immigrant composition actually becomes positive and mathematics while the effect of Dominican immigrant composition remains negative for both exams. These results are more consistent with the theoretical research on these two groups than the model presented previously. As a matter of policy however, given that immigrant children are correlated with each other, it probably does not make sense to tailor policies based on any particular ethnic group, but to focus on policies for all immigrants.

This dissertation is divided into six chapters. Chapter two focuses on the theoretical and empirical issues involved in estimating peer effects. Three challenges to the estimation of peer effects are the selection problem, the correlated effects problem, and the reflection problem. It also reviews the strategies studies have used to estimate peer effects and findings of these studies. A consensus appears to have emerged on several issues in peer

effects research. In general, peer group test score performance is positively associated with student outcomes. Female peers and high SES peers also appear to have positive effects.

Chapter three presents the data and methodology used in this study including a discussion of the setting of this study, New York City. I also present the empirical model and limitations of this study. Chapter four is centered on East Asian immigrant composition effects, and reviews the literature on East Asian immigrant performance. It also presents hypotheses for testing East Asian immigrant composition effects and presents results of analyses of these effects. Chapter five follows a similar track but is interested in the outcomes of Dominican immigrant children. It concludes by presenting results of regressions estimating Dominican composition effects. The final chapter summarizes the findings of this study, presents policy recommendations, summarizes limitations of the study, and offers suggestions for public policy.

Chapter 2

THE CHALLENGE OF ESTIMATING PEER EFFECTS

American children spend approximately 6.5 hours a day, 180 days a year, in school (Silva, 2007). Much of this time is spent in the company of other children. This circumstance has not been lost on the research community. Prompted by the publication of the influential Coleman Report, a large body of research has examined the impact of school peers on student outcomes. D. N. Harris (2010, p. 1167) defines a peer as, "…another student with whom the individual student comes in contact in school-related activities." Peer effects occur "…when the outcomes…of an individual student are influenced by the behaviors, attitudes, or other characteristics of other students with whom they interact during school activities." Research on peer effects has developed along two lines, one focusing on peer composition, or contextual effects, and one focusing on peer behavior or outcomes, also known as endogenous effects.

Peer effects, if they exist, have important implications for education policy. In fiscally strained times, governments are interested in maximizing the effect of every dollar spent. An understanding of how students impact each other's learning is essential to achieving this goal. For example, cost-benefit analyses that analyze the effect of individual programs may be understating or exaggerating their effects by not accounting for peer effects. A program for limited English proficient children for example, may be worthwhile if it has positive effects for both limited English proficient (LEP) children as well as their

peers.[1] On the other hand, it may not be cost-effective if it only affects the outcome of this selected group.

Endogenous peer effects in particular, are essential to studying issues related to tracking. Tracking, or ability grouping, may be efficient if it allows teachers to better tailor the pace and content of instruction to students' needs. Proponents also argue that ability grouping makes students more comfortable and engaged because they are surrounded by similar children. In addition, some suggest high-achievers flag when they are in classes with low-performers (Westchester Institute for Human Services Research, 2002). On the other hand, if low-achieving children benefit from heterogeneous classes, and high-achievers are not harmed, ability grouping would produce Pareto inferior outcomes. School voucher and other school choice programs have been accused of cream-skimming i.e. luring the best students from regular public schools (Altonji, Huang, & Taber, 2009), creating schools with better performing students and schools with the remaining students who are of lesser performance. If "bad peers" gain more from "good" peers than "good" peers are harmed by "bad" peers, such programs would create socially inefficient outcomes (Gorman, 2001).

Contextual peer effects have important implications for segregation. The landmark case of Brown v. Board of Education made the legal segregation of public schools unconstitutional. The Supreme Court agreed with the lower court's finding that: "Segregation of white and colored children in public schools has a detrimental effect upon the colored children." In reaching their decision, the Court used psychological evidence

1 Although I use limited English proficient (LEP), English language learner (ELL), and English as a second language (ESL) interchangeably, there are some technical differences between the terms. An ELL is "an active learner of the English language who may benefit from various types of language support programs" (National Council of Teachers of English, 2008, p. 2). LEP students are a subset of ELLs who passed their state English language proficiency exams (Ballantyne, Sanderman, & Levy, 2008; Cho, 2011). Finally, ESL refers to instruction designed to support ELL (National Council of Teachers of English, 2008).

suggesting segregation was inimical to the self-esteem of black children. Some scholars however, suggest that segregation may actually have some beneficial effects. These so-called frog-pond models argue that students in minority-concentrated schools may benefit from improved optimism, increased class rank, and more rigorous course work (Goldsmith, in press). Some scholars have even suggested that racial diversity can have negative consequences for economic growth (Alesina, Baqir, & Easterly, 1999; Easterly & Levine, 1997; Hall & Leeson, 2010).

Due to the increasing availability of large longitudinal administrative databases, the research on peer effects has grown by leaps and bounds in recent years. Nevertheless, there remain multiple challenges to the estimation of peer effects. I begin this chapter by presenting a conceptual framework for understanding peer and other types of social effects. Section three discusses the challenges involved with estimating peer effects. These challenges consist of the reflection problem, the correlated effects problem and the selection problem. This section also examines solutions to these problems as well as the importance of peer group choice. Section four reviews the literature on endogenous and exogenous peer effects and synthesizes the findings in this literature. Section five reviews the literature on immigrant composition effects. The results of this review suggest a growing consensus that immigrant composition has negative effects on student achievement. Section six summarizes the findings of this chapter.

2.2. Theoretical Research on Peer Effects

In this section, I present the theory that has been developed on peer effects. I will draw on this theory in my own analysis and to develop a theory of immigrant composition

effects. Moffitt (2001) presented a model where there were $g = 1, \ldots, G$ groups and only two individuals $(i = 1, 2)$ per group. For each individual i in group g, let y be the outcome of interest, a test score for example. X_{ig} is an individual exogenous characteristic, say immigrant status for individual i in group g, and ε_{ig} is a random error term. Assuming linearity gives the following system of equations:

$$y_{1g} = \beta_0 + \beta_1 X_{1g} + \beta_2 X_{2g} + \beta_3 y_{2g} + \varepsilon_{1g}; \quad (2.1)$$

$$y_{2g} = \theta_0 + \theta_1 X_{2g} + \theta_2 X_{1g} + \theta_3 y_{1g} + \varepsilon_{2g}. \quad (2.2)$$

One can easily think of equations (2.1) and (2.2) in terms of immigration. X_g, in other words, is a dummy variable indicating if a child in group g is foreign-born. To simplify, let us assume that child *1* is native-born and child *2* is foreign-born. What this means is that the achievement for foreign-born student *2*, y_{2g}, is a function of the child's foreign-born status, X_2, the achievement of student *2*, y_2, the native-born status of X_1, and the achievement of student 1, y_{1g}. Similarly, the achievement of student *1* is a function of the immigrant status of X_2, the achievement of student *2*, y_2, and the individual's own native-born status.

Manski (1993) calls β_2 and θ_2 the estimates of exogenous, or contextual, effects. In the immigrant example the indicator variable for immigrant status, is an exogenous effect. β_3 and θ_3 are the endogenous effects. They are endogenous because the variables appear on both the left and right-hand sides of equation. For student *1*, his achievement is a function of student *2*'s whose achievement is a function of student *1*. This "multiplier effect" creates an empirical challenge called the reflection problem. The reflection problem makes it impossible to distinguish whether student *1* impacts student *2*'s achievement or vice-versa, without additional exclusion restrictions.

According to Manski (1993, p. 532), endogenous effects occur when, "… the propensity of an individual to behave in some way varies with the behavior of the group." An example is a measure of peer performance on standardized exams. Exogenous effects occur when, "… the propensity of an individual to behave in some way varies with the exogenous characteristics of the group." Examples of exogenous characteristics are race, income, and nativity. Together, the literature has called both exogenous and endogenous effects, peer effects (Cooley, 2007).

2.3. Empirical Issues in the Estimation of Peer Effects

While the theory behind peer effects is relatively straightforward, empirically implementing the Manski (1993)/Moffitt (2001) model has proven exceptionally difficult. Three main problems plague the estimation of peer effects: the reflection problem, the correlated effects problem, and the selection problem.

The Reflection Problem.

The reflection problem may be the most intractable of the three problems discussed in this section. In the model presented in equations (2.1) and (2.2), the reflection problem occurs because not only does the behavior (e.g. a test score) of student *2*, affect the behavior student *1* but vice-versa. While the reflection problem is most directly associated with the estimation of endogenous peer effects, failure to adequately address the reflection problem means estimates of exogenous peer effects are biased as well. The Manski/Moffit model demonstrates why the reflection problem affects estimates of all peer effects.

To derive the reduced form coefficients for equation (2.1), we can substitute the equation for y_2 into the equation for y_1. This yields:

$$y_{1g} = \beta_0 + \beta_1 X_{1g} + \beta_2 X_{2g} + \beta_3(\theta_0 + \theta_1 X_{2g} + \theta_2 X_{1g} + \theta_3 y_{1g} + \varepsilon_{2g}). \quad (2.3)$$

Multiplying β_3 out yields equation (2.4):

$$y_{1g} = \beta_0 + \beta_1 X_{1g} + \beta_2 X_{2g} + \beta_3\theta_0 + \beta_3\theta_1 X_{2g} + \beta_3\theta_2 X_{1g} + \beta_3\theta_3 y_{1g} + \beta_3\varepsilon_{2g} + \varepsilon_{1g}. \quad (2.4)$$

Combining the error terms and factoring for X_{1g} and X_{2g} results in equation (2.5):

$$y_{1g} = \beta_0 + \beta_3\theta_0 + (\beta_1 + \beta_3\theta_2)X_{1g} + (\beta_2 + \beta_3\theta_1)X_{2g} + \beta_3\theta_3 y_{1g} + \beta_3\varepsilon_{2g} + \varepsilon_{1g}. \quad (2.5)$$

Subtracting $\beta_3\theta_3 y_{1g}$ from both sides and dividing by $1/(1-\beta_3\theta_3)$ gives the final reduced form equation for y_{1g}. Combining the constant terms and error terms yields equation (2.6)

$$y_{1g} = K_{1g,2g} + \frac{\beta_1+\beta_3\theta_2}{1-\beta_3\theta_3} X_{1g} + \frac{\beta_2+\beta_3\theta_1}{1-\beta_3\theta_3} X_{2g} + \varepsilon_{1g,2g}, \quad (2.6)$$

where K is the combined constant term. As seen in equation (2.6), both the estimates of X_{1g} and X_{2g} are composed of coefficients from both equations including the coefficients from the endogenous effect terms, β_3 and θ_3.

Remedies for the reflection problem.

Most studies on peer effects do not directly address the reflection problem and instead estimate a "reduced form" model. In fact, many studies that attempt to estimate exogenous effects do not mention the reflection problem, perhaps because the problem is so intractable. Another method to address this simultaneity issue is to use instrumental variables regression, as many of studies described in the section on selection do. A related approach is to use spatial autoregressive models (SAR), which are described below.

A popular approach is to use lagged peer behavior, e.g. test scores as a proxy for peer achievement. The strength of this method depends on the strength of the relationship

between current achievement and peer achievement. As discussed by Hanushek, et al. (2003), lagged achievement is a good proxy for current achievement if there are no year-to-year shocks in current behavior. If the difference between current and lagged measures of peer achievement is random, the estimates of peer effects are attenuated. In addition, lagged average achievement is likely to be endogenous due to serial correlation with unobserved teacher, school and individual factors.

Another approach is to estimate variables that are conceptually related to endogenous peer effects. This approach was used by Lavy, Paserman, & Schlosser (2008), who used a predetermined proxy for student ability that had not been affected by the ability of his or her peers, namely students who have been held back a grade. Some higher education studies on peer effects used pre-treatment measures such as admission academic ratings and SAT scores as their measure of peer quality. Some studies have used a contemporaneous proxy variable. Levin (2001) proxied for peer ability with the number of students with similar IQ, an approach first used by Henderson, Mieszkowski, & Sauvageau (1978). Contemporaneous proxies have the advantage that they are a better measure of peer quality at a given point in time, but may still suffer from the reflection problem if a student's own behavior can affect the proxy variable.

A related approach is to use composite measures of peer behavior. These are measures consisting of both exogenous and endogenous peer effects, where a specific group is assumed to be correlated with a specific level of a behavior. For example, Dills' (2005) composite involved the share of students leaving for a public magnet school from the original public school system, which one would assume is a high ability group. Angrist & Lang (2004) analyzed the effects of an influx of low-performing Metco students on

native students. Table 2.1 summarizes the methods that have been used to resolve the reflection problem.

Table 2.1: Remedies for the Reflection Problem

Composite Measure	*Lagged Measure*	*Pre-Determined Measure*	*Reduced Form*
Angrist & Lang (2004)	Babcock & Hartman (2010)	Arcidiacono & Nicholson (2005)	Arcidiacono et al. (2007)
Bonesrønning (2008)	Betts & Zau (2004)	Brunello & Scoppa (2010)	Burke & Sass (2008)
Carrell & Hoekstra (2010)	Carman & Zhang (2008)	Brunello et al. (2010)	Davies & Kandel (1981)
Dills (2005)	Carrell et al. (in press)	Carrell et al. (in press)	Entorf & Lauk (2008)
Imberman et al. (2009)	Dumay & Dupriez (2008)	Carrell, Fullerton, & West (2009)	Foster & Frijters (2010)
Lu (2010)	Fortner (2010)	Ding & Lehrer (2007)	Glaser (2009)
	Gibbons & Telhaj (2006)	Lavy et al. (2008)	Go (2010)
Contemperaneous Proxy	Gibbons & Telhaj (2006)	Lu (2010)	Kramarz et al. (2010)
Frölich (2005)	Gibbons & Telhaj (2008)	Lyle (2007)	Leiter (1983)
Henderson et al. (1978)	Gibbons & Telhaj (2008)	Machado & Vera-Hernandez (2010)	Mora & Oreopoulos (in press)
Levin (2001)	Hanushek et al. (2003)	Oosterbeek & van Ewijk (2010)	Sokatch (2006)
	Hoxby & Weingarth (2006)	Parker et al. (2010)	Svensson (2010)
Instrumental Variables	Kiss (2011)	Ryabov (in press)	
Ali & Dwyer (2010)	Neidell & Waldfogel (2010)	Sacerdote (2001)	*Spatial Autoregressive Model*
Ali & Dwyer (2011)	Richards (2010)	Stinebrickner & Stinebrickner (2006)	Boucher et al. (2010)
Asadullah & Chaudhury (2008)	Sojourner (2011)	Winston & Zimmerman (2004)	De Giorgi et al. (2010)
Atkinson et al. (2008)	Sund (2009)	Yakusheva et al. (2011)	Fortin & Yazbeck (2011)
Boozer & Cacciola (2001)	Vigdor & Nechyba (2007)	Zimmerman (2003)	Lin (2010)
Clark et al. (2009)	Wang (2010)		Patacchini et al. (2011)
Cooley (2006)	Yakusheva et al. (2011)		
Cooley (2010)	Zhang (2010)		
DePaola & Scoppa (2010)			
Duflo et al. (2008)			
Evans et al. (1992)			
Feinstein & Symons (1999)			
Fletcher (2010)			
Gaviria & Raphael (2001)			
Graham (2008)			
Halliday & Kwak (2007)			
Hoxby & Weingarth (2006)			
Jackson (2010)			
Zabel (2008)			

The unspoken assumption in these methods is that peer behavior is innate or unchanging. Ability in the previous period is the same as ability in the current period. A Metco student is a low-performer all the years he or she is a Metco student. Cooley's (2006) study is a rare study that attempts to capture the transitory component of peer behavior. Her study relied on the exogenous change in behavior caused by the introduction of a student accountability policy by the State of North Carolina to identify peer effects. The policy and resulting behavior change only affected a specific group of children.

Correlated Effects

Another set of explanations as to why members of the same group tend to behave in the same way are called "correlated effects." Correlated effects occur when, "individuals in the same group tend to behave similarly because they have similar individual characteristics or face similar institutional environments" (Manski, 1993, p. 533). In the immigrant example, we may observe that schools with large shares of immigrant children also have native-born children with high achievement. One explanation may be that the presence of these immigrant children, because of their immigrant status and no other variable, caused the native-born children to do better. Another reason why we may observe this phenomenon is because immigrant children also tend to come from two-parent households (Chaudry & Fortuny, 2010). It is a high share of children from two-parent families that is responsible for the high achievement of the native-born students.

The correlated effects problem makes estimation of peer effects difficult because they represent a form of omitted variables bias. The estimate of an immigrant peer effect for example, becomes a reduced-form estimate of the immigrant peer effect and the other characteristics correlated with immigrant status, like the prevalence of two-parent households. This omitted variables problem cannot be solved through random assignment as random assignment would not break the correlation between immigrant share and the prevalence of two-parent households.

These distinctions are important not only as it comes to estimation but also as it comes to policy. If immigrant children exert positive peer effects because they are better students, it would make more sense increasing the share of students with higher test scores

as a way of improving student achievement rather than increasing the share of immigrant students. In practice however, it may not be possible to simply increase the share of high achieving students in a school. The immigrant variable may be the only variable under the control of school administrators. In addition, one can argue that certain characteristics immigrant children share are an integral part of the immigrant experience. One cannot separate the high achievement of immigrant children, empirically at least, from the experience of being an immigrant child.

One can divide correlated effects into three sets. The first type occurs when individuals sort into a setting where a particular peer attribute is prevalent in a non-random way. If better teachers tended to gravitate towards schools or classrooms with large shares of immigrant children, this phenomenon may suggest immigrant concentration increases achievement when it is really the presence of higher quality teachers.

The second type of correlated effect results from the fact that peers with a high prevalence of one type of behavior, outcome or exogenous characteristic may have a high prevalence of another type of behavior, outcome or exogenous characteristic. For example, an individual student's achievement may be a function of the average performance of the child's classroom but also from the high rate of involvement of the class' parents. In this example, the endogenous effect of average performanceis a composite of both the exceptional ability of the classroom and the high rate of parental involvement. In the case of immigrant children, a high prevalence of limited English proficiency may explain a negative relationship between immigrant composition and achievement and not immigrants directly.

The third and final type of correlated effect may be called correlated shocks. Because peers share the same setting they may share the same shocks that affect behavior or outcomes. If there was a change in testing, perhaps aimed at LEP students, this shock may affect the performance of immigrant children, which may in turn affect the performance of individual students. These correlated effects have important implications for understanding the mechanisms behind peer effects as many of the mechanisms behind peer effects are a combination of correlated effects and endogenous or exogenous peer effects.[2]

An estimate of immigrant peer effects is likely to be a reduced-form composite of exogenous, endogenous and correlated effects. It is a composite because the exogenous effect of immigrant status is intrinsically linked to the correlated effects associated with immigrant status. In addition, the reflection problem makes it difficult to isolate the effect of peer performance on individual performance and vice-versa. This means that the estimate of immigrant peer effect is to some extent biased. Random assignment would help to resolve problems of selection but not the reflection or correlated effects problems.

There are several important weaknesses to a reduced-form model. With a reduced-form model, it becomes virtually impossible to understand the underlying behavior involved in the effect that is estimated. In addition, a structural model would provide precise estimates of treatment effects as the results are not confounded by other coefficients. However, the reflection and correlated effects problems may not be exceptionally relevant as it comes to policy. One can argue that certain characteristics immigrant children share are an integral part of the immigrant experience. A reallocation of

[2] Because the coefficient on the immigrant share variable is made up of exogenous, endogenous, and correlated effects, I tend to avoid using the term immigrant peer effect in this study. Instead, I favor the term, immigrant composition effect, for the research conducted in this dissertation.

immigrant students would affect observed peer characteristics as well as peer behaviors (Friesen & Krauth, in press).

The Selection Problem

The selection problem emerges because a student's peers are not randomly assigned or randomly distributed. Families select the communities they live in and the schools their children attend. For instance, high-ability students may attend classes in schools with other high-ability students and perform well independent of the composition of their peers. Classrooms and schools with large shares of African-American or students receiving free lunch may also be associated with the least qualified teachers. In a perfect experimental setting, one would assign immigrants randomly to schools. However, most social science situations do not involve random assignment so researchers have developed numerous techniques to address the selection problem. One can consider this a form of correlated effects problem but I consider it a selection problem because it can be solved by random assignment.

Not adequately addressing the selection problem results in regression coefficients for the independent variable of interest that are subject to omitted variable bias. An illustration of omitted variable bias in peer effects is presented in equation (2.7). Equation (2.7) replicates equation (2.1) but adds in an additional explanatory variable, U_{1g}:

$$y_{1g} = \beta_0 + \beta_1 X_{1g} + \beta_2 X_{2g} + \beta_3 y_{2g} + U_{1g} + \varepsilon_{1g}. \quad (2.7)$$

As previously, X_{2g} is the exogenous effect we are interested in estimating, nativity for example. There would be omitted variable bias if U_{1g} was correlated with y_{1g} and X_{2g} and we had not adequately controlled for U_{1g}. U_{1g} could be the presence of high performing

pers. If high peer achievement affected the achievement of student *1*, omitting this variable would bias the estimate of the effect of student *2*'s immigrant status on student *1*'s test score.

Researchers have developed a number of sophisticated and clever ways to deal with the selection problem. Studies addressing this selection problem have taken five general approaches: cross-sectional designs, natural experiments, fixed effects models, value-added models, instrumental variables models, quasi-experimental designs and grade-cohort variation. It should be noted that many, if not most, of the studies reviewed here combine multiple strategies in their identification strategies.

Cross-Sectional Designs.

The earliest peer effects articles relied on cross-sectional variation in the characteristics or achievement of peers to identify peer effects. Selection in these studies has been dealt with by controlling in a multiple regression framework various student, family, and school characteristics. The idea behind this strategy is straightforward. If you know *U* in equation (2.7), control for it, thereby avoiding the omitted variable problem. Articles using the cross-sectional approach are presented in Table 2.2.

As discussed by Hoxby (2000b), none of these methods is completely satisfying as they do not address the issue of selection on unobservables. As discussed above, unobserved student motivation differences may bias estimates of peer effects if students that are more able select into schools with high concentrations of immigrant students. The cross-sectional approach also requires the researcher to know what the relevant omitted variables are. Simply adding variables can lead to multi-collinearity (Ribar, 2003). Included

in Table 2.2 are multilevel or hierarchical linear models and random effects models, which use both between and within unit variation to estimate coefficients (Chaplin, 2003).

Table 2.2: Studies Using Cross-Sectional Variation

Abrahamse, Morrison, & Waite (1988)	Hanushek (1972)
Alvarado & López Turley (2008)	Hinrichs (2011)
Arcidiacono & Vigdor (2008)	Hogrebe & Tate IV (2010)
Aveyard et al. (2005)	Iturre (2005)
Benner & Crosnoe (2011)	Jencks & Brown (1975)
Berends and Peñaloza (2010)	Jimenez, Lockheed, Luna, & Paqueo (1989)
Bonesrønning (2008)	Lee & Byrk (1989)
Bryk & Driscoll (1988)	Leiter (1983)
Burns & Mason (2002)	Levin (2001)
Butler (2010)	Levin (2001)
Caldas & Bankston (1997)	Mayer (1991)
Cebolla-Boado, H., & Medina, L. G. (in press)	Mora & Oreopoulos (in press)
Coleman et al., (1966)	Muller, Riegle-Crumb, Schiller, Wilkinson, & Frank (2010)
Cortes (2005)	Opdenakker & Van Damme (2001)
Crosnoe & Lopez-Gonzales (2005)	Perry & McConney (2010)
Daniel et al. (2001)	Pong (1998)
Davies & Kandel (1981)	Rangvid (2004)
Di Paolo (2010)	Richmond et al. (2006)
Driessen (2002)	Riegle-Crumb & Callahan (2009)
Dumay & Dupriez (2008)	Rumberger (1995)
Entorf & Lauk (2008)	Rumberger & Palarfy (2005)
Fortner (2010)	Ryabov (in press)
Foster and Frijters (2010)	Sakellariou (2008)
Frost (2007)	Sokatch (2006)
Furstenberg Jr., Morgan, Moore, & Peterson (1987)	Southworth & Mickelson (2007)
Glaser (2009)	Summers & Wolfe (1977)
Go (2010)	Svensson (2010)
Goldsmith (2003)	Sykes & Musterd (in press)
Goldsmith (in press)	Willms (2010)
Hallinan & Williams (1990)	Winkler (1975)
Note: Includes multi-level and random effects models.	

Natural Experiments.

Other studies have relied on "natural experiments," where a policy change or actual event introduces exogenous variation that allows researchers to estimate the impact of peers without bias. The validity of these studies depends on the actual "randomness" of the variation, though several studies have produced convincing results. Formally, to go back to the student ability example, let us assume that high performing students select into schools with high levels of immigrant children.

In the natural experiment, X_2 or any other variable of interest is randomly assigned to participants. For example, many of the studies at the higher education level use random assignment to roommates. Their measure of peer ability, SAT scores, is hence, also randomly assigned. The natural experiment addresses the problem of selection by breaking the correlation between X_2 and U. Omitted variables bias only occurs if U is omitted and is correlated with both X_2 and ε. Because X_2 is randomly assigned, there is no correlation with U and hence no omitted variables bias. U becomes a component of the random error term. Examples of a natural experiment in studying peer effects at the higher education level are presented in Table 2.3:

Table 2.3: Natural Experiments

Higher Education		*K-12*
Babcock & Hartman (2010)		Angrist & Lang (2004)
Brunello et al. (2010)		Bobonis & Finan (2005)
Carrell et al. (in press)		Dills (2005)
Carrell et al. (2009)		Duflo, Dupas, & Kremer (2008)
Lu (2010)		Hoxby & Weingarth (2006)
Lyle (2007)		Hoxby (1998)
Oosterbeek & van Ewijk (2010)		Imberman, Kugler, & Sacerdote (2009)
Parker et al. (2010)		Kang (2007)
Sacerdote (2001)		Lai (2007)
Stinebrickner & Stinebrickner (2006)		Sojourner (2011)
Winston & Zimmerman (2004)		Wang (2010)
Yakusheva et al. (2011)		
Zimmerman (2003)		

Fixed Effects.

Some studies have included "fixed effects" in their regression model, which control for variables that affect achievement and other educational outcomes of individuals, schools, or grades, observed and unobserved, that do not change over time. This strategy reduces bias by identifying peer effects through intra-unit variation in peer achievement

and characteristics. To illustrate the use of fixed effects, it is necessary to extend equation (2.7) so that there are more than two individuals in a group.

$$y_{ig} = \beta_0 + \beta_1 X_{ig} + \beta_2 I_{ig} + \beta_3 \overline{y_g} + U_{ig} + \varepsilon_{ig}. \quad (2.8)$$

Now let us assume that the test score for each student *i* in school *g*, is a function of a set of exogenous characteristics for that student like race, socioeconomic status *X*, the share of children in the school with a certain exogenous characteristic like the share of immigrant children *I*, the average test score in the school $\overline{y_g}$, the unobserved variable *U*, and an error term ε_{ig}.

To illustrate the idea behind fixed effects, let us use the school as the fixed effect. When controlling for school fixed effects, the researcher assumes that the error term ε_{ig} is composed of two parts: let us call them μ_g and ε_{ig}. Equation (2.8) hence becomes equation (2.9):

$$y_{ig} = \beta_0 + \beta_1 X_{ig} + \beta_2 I_{ig} + \beta_3 \overline{y_g} + \mu_g + e_{ig}. \quad (2.9)$$

μ_g is a school fixed effect for school *g*. e_{ig} is a stochastic error term for each student *i* in group *g*. The fixed effect estimator in effect creates a dummy variable for each cross-sectional observation; in this case, there is a dummy variable for each school. Controlling for a school fixed effects removes all the variation between schools, relying only on the variation in immigrant share across cohorts or across classrooms within schools to identify the effect of immigrant share on student achievement.

The problem with fixed effects estimators is that they do not control for characteristics that do change over time. In addition, if unobserved effects are at the classroom level, school fixed effects would do little to address the bias caused by classroom-level fixed effects. As fixed effects estimators are the equivalent of dummy

variable regression, precise estimates may require many observations. Examples of these models are presented in Table 2.4.

Table 2.4: Fixed Effects Studies

Study	Unit	Study	Unit
Acidiacono & Nicholson (2005)	School	Hanushek et al. (2009)	Individual, school-by-grade, district-by-year
Aizer (2008)	Individual	Henderson et al. (1978)	Value-added
Ali & Dwyer (2010)	School	Hoxby & Weingarth (2006)	Individual and grade by school-year
Ali & Dwyer (2011)	School	Hoxby (2000a)	School and school-specific time trends
Ammermueller & Pischke (2006)	School	Hoxby (2000b)	Value-added and district fixed effects
Angrist & Lang (2004)	School and year	Jackson (2010)	Cohort and school
Archidiacono et al. (2007)	Classroom	Kang (2007a)	Individual and school
Arcidiacono et al. (2007)	Peer and Individual	Kang (2007a)	Individual school
Atkinson et al. (2008)	School-by-year	Kang (2007b)	School
Betts & Fairlie (2003)	Metropolitan	Kiss (2011)	School
Betts & Zau (2004)	Individual, school, home zipcode, year, grade, and value-added	Kramarz et al. (2010)	School and year
Betts (1998)	State	Lai (2007)	School
Bifulco et al. (2008)	School and school-specific time trends	Lavy & Schlosser (2007)	School and school-specific time trends
Bonesrønning (2008)	Value-added	Lavy et al. (2008)	School and school-specific time trends
Boozer & Caccicola (2001)	School	Lavy et al. (2009)	Individual
Brunello & Rocco (2011)	Country	Lefgren (2004)	School-by-year and value-added
Burke & Sass (2008)	Peer, grade, year and individual and value-added and teacher-school spell effects	Link & Mulligan (1991)	Value-added
Carmen & Zhang (2008)	Individual	Lott. Jr. et al.	Student, class, professor, and semester fixed effects
Carrell et al. (2008)	Academy, class and academy-specific time trends	Lu (2010)	Department, year and province
Carrell et al. (2009)	Course-by-section and year	Machado & Vera-Hernandez (2010)	Course, teacher, and year
Carrell et al. (in press)	Cohort-by-year-by-semester and state of residence	McEwan (2003)	School and family
Carrell & Hoekstra (2010)	School-by-grade and grade-by-year	Mora & Oreopoulos (in press)	High school
Cho (2011)	Individual and school	Neidell & Waldfogel (2010)	Value-added models and school fixed effects
Cooley (2006)	Teacher	Proud (2008)	School and school-specific time trends
Cooley (2010)	School-by-year	Richards (2010)	School-by-grade
Ding & Lehrer (2007)	School and school-type and value-added	Rivkin (2000)	Value-added
Duflo et al. (2008)	School	Sacerdote (2001)	Dormitory
Dumay & Dupriez (2008)	Value-added	Schneeweis & Winter-Ebmer (2006)	School
Dupas et al. (2008)	School	Schwartz & Stiefel (2010)	School or school-by-grade
Figlio (2007)	Individual and grade	Sojourner (2011)	School
Fletcher (2010a)	Grade and school	Sund (2009)	Year, school, teacher and individual fixed effects
Fletcher (2010b)	Individual and school	Vandenberghe (2002)	County
Fletcher & Tienda (2009)	Year and high school	Vigdor & Nechyba (2004)	School-by-year
Friesen & Krauth (2010)	School and value-added	Vigdor & Nechyba (2007)	Teacher, school and year and value-added
Friesen & Krauth (in press)	School and value-added	Wang (2010)	Cohort
Friesen et al. (2010)	School-by-grade	Whitmore (2005)	School
Frölich (2004)	Value-added	Winston & Zimmerman (2004)	School
Frölich (2005)	Value-added	Yakusheva et al. (2011)	Value-added
Gibbons & Telhaj (2006)	Value-added	Zabel (2008)	School or student
Gibbons & Telhaj (2008)	Value-added	Zhang (2010)	Cohort and school
Graham (2008)	School	Zimmer & Toma (2000)	Value-added
Hanushek et al. (2003)	Student and school-by-grade	Zimmerman (2003)	Cohort

Individual fixed effects.

Individual fixed effects models are intuitively appealing. If we can control for individual fixed effects, we can control for individual-level characteristics such as ability and drive that are difficult to observe but do not change over time. The problem is that

people do change especially during childhood, and change at different rates. Children mature, they make different choices, and have different preferences. It is possible within the context of this study that immigrant children mature quicker than native-born children and this maturity results in selection of better teachers with more able peers. If we do not control for teacher quality adequately, the omitted variable bias once again emerges.

Value-added models.

The value-added model is implemented by controlling for a lagged test score on the right hand side of the regression model. In this case, the prior year test score serves to control for the cumulative effect of various educational inputs that have contributed to the current year's test score including past peer effects. The modeling of the value-added model requires an additional subscript (*t*) to equation (2.9), which becomes equation (2.10):

$$y_{igt} = \beta_0 + \beta_1 X_{igt} + \beta_2 I_{gt} + \beta_3 \bar{y}_{gt} + \beta_3 U_{igt} + y_{igt-1} + \varepsilon_{igt}. \quad (2.10)$$

The *t* in equation (2.10) is an indicator for the time period the observation was produced.

Valued-added models are not a panacea. Conceptually, the effects of student ability and grade and school quality are assumed to be fixed over the course a student's life.[3] The lagged test score may also introduce endogeneity into the model because of the positive correlation between the lagged test score measure and its measurement error (Todd & Wolpin, 2003).

Instrumental variables models.

[3] This situation is unlikely to be the case with most students because of measurement error in the lagged test score, necessitating the reintroduction of fixed effects for students, grades and schools.

A large number of these studies make use of two-stage least squares or instrumental variables (IV) regression. In IV regression, researchers look for a variable, or instrument, that is correlated with the endogenous regressor in question, but not with the error term. The strength of the design is dependent on the validity of the instrument. A valid instrument must satisfy two conditions. First, immigrant share must be correlated with the instrument. This condition can be tested with a partial F-test, but is an essential condition as IV regression with weak instruments can result in estimates more biased than under ordinary least squares (Murray, 2006). Second, the instrument cannot be correlated with the error term. With more than one instrument, an overidentification test can be conducted, which can indicate whether at least some of the IVs are exogenous. This test cannot be used with a single instrumental variable, nor does it tell you which instrument is endogenous. In the end, intuition and theory are probably the best test of the exogeneity of an instrument. Table 2.5 presents some of instruments that researchers have used to examine peer effects.

Table 2.5: Instrumental Variables Studies

Study	Endogeous Regressor	Instrument
Aizer (2008)	Share of classmates with undiagnosed ADD	Medicaid/SCHIP eligibility thresholds in the state and year and the threshold interacted with the child's age
Ali & Dwyer (2010)	Proportion of peers who drank alcohol in the last 12 months and average drinking score	Share of peers with parents who drink; share of peers who have easy access to alcohol at home; share of peers who live with both biological parents; the share of peers whose parents are welfare recipients
Ali & Dwyer (2011)	Share of peers initiating sex and average age of peer sexual partners	Share of peers who have discussions about sex with their mother; share of peers whose mother approve of having sex at the current age; share of peers whose mothers approve of having sex with a romantic partner; share of peers who live with both biological partners
Ammermueller & Pischke (2006)	Mean of parents' report of the number of books at home	Mean of students' report of the number of books at home
Angrist & Lang (2004)	Share of Metco students in cohort	Class size rule
Asadullah & Chauhury (2008)	Average school test score	Share of school exposed to arsenic contaminated water wells at home
Atkinson et al. (2008)	Average lagged test score	Measure of how similar classmates are similar
Bobonis & Finan (2005)	School enrollment rate in village	Progresa program
Boozer & Cacciola (2001)	Average class test score	Share of class previously exposed to the Small class treatment
Carrell et al. (2008)	Share of students at academy who cheated in academy	Share of students at academy who cheated in high school
Clark et al. (2009)	Average class economics test score	Average peer geometry and algebra scores
Dupas et al. (2008)	Average end line score of classmates	Dummy for being in the "bottom half" of the initial distribution
Elder & Lubotsky (2009)	Class average age	Children's predicted kindergarten entrance age if they were to begin school when first allowed by law
Evans et al. (1992)	Share of schoolmates classified as economically disadvantaged	Metropolitan area unemployment rate, median family income, poverty rate, and the percentage of adults who completed college
Feinstein & Symons (1999)	Peer group index	Local authority dummy variables
Fliglio (2007)	Share of children in a class who get suspended at least once for five or more days	Share of child's male classmates who have names more commonly given to girls than to boys
Fletcher (2010a)	Share of smokers in cohort	Shares of cohort with older siblings and with a household member who smokes
Fletcher & Tienda	Number of high school classmates who enroll at UT-Austin at the same time as student	Presence of Top 10% program in enrollee's high school when the student applied to UT-Austin
Gaviria & Raphael (2001)	Average school deviant and social behavior	Average school parental-involvement, share of schoolmates whose parents have had drug problems and have some college education, and the share of classmates who live in single-parent families
Gibbons & Telhaj (2006)	Average lagged attainment	Average lagged attainment of new peers
Gibbons & Telhaj (2008)	Average lagged achievement	Average lagged achievement of new peers
Graham (2008)	Average class test score	Class size
Halliday & Kwak (2007)	Average levels of peers' smoking, drinking, sexual behavior and educational achievement	Averages of dummy variables for whether or not the mothers and fathers of the peer group members have college degrees
Hoxby & Weingarth (2006)	Average lagged class test score	Average initial test scores of group of students who would be in student's cohort if reassignments are allowed but all potentially endogenous student movement is disallowed
Hoxby (2000b)	Black and gender composition	Population variation in black and gender composition
Kang (2007b)	Average class math score	Mean class science score
Lefgren (2004)	Average class test score	Interaction between a student's own achievement and the school's tracking policy
Machado & Vera-Hernandez (2010)	Share of repeater students in year *t*	Share of repeater students in year *t-1*
Puskin (2010)	Share of black friends	Number of same gendered black friends in class
Richards (2010)	Share of cohort that is not a virgin	Averages of sibling structure, age of menarche, mother's current marital status, Hispanic ethnicity, foreign-born parent, household income
Robertson & Symons (2001)	Socioeconomic composition	Region of birth
Zabel (2008)	Average class test score	Class size
Zhang (2010)	Average cohort test score	Lagged test score of new peers

Some of the instruments used have been quite clever. Aizer (2008) relied on exogenous improvements in classmates' inattention or impulsivity that result from a diagnosis of attention deficit disorder (ADD). Her instrument for diagnosis of ADD was expansions in public health insurance. Asadullah & Chauhury (2008) identified endogenous peer effects with information on arsenic contamination of water wells. Figlio (2007) instrumented the fraction of children in a class who get suspended at least once for five or more days with the fraction of a child's male classmates who have names more commonly given to girls than to boys. The intuition behind this instrument is that these boys with effeminate names were bullied more often which resulted in bad behavior.

A variation of the IV technique was proposed by Graham (2008). He identified peer effects from the Project STAR experiment through conditional variance restrictions. This method was also used by Zabel (2008) in his study of peer effects in New York schools. The instrument in this method must generate exogenous variation in peer group effects yet hold constant group-level heterogeneity. The instrument Graham uses is class size.

Other methods.

Vigdor & Nechyba (2004) studied students enrolled in schools where the distribution of student characteristics across classrooms was consistent with random assignment. Apparent random assignment was defined as classrooms marked by a relatively even distribution of six separate student characteristics across classrooms. (MacCoun, Cook, Muschkin, & Vigdor (2008) relied on a combination of a matching procedure and differences-in-differences estimation to study the impact of school-level variables as the share of free or reduced price lunch children, the share of black and

Hispanic children, and the share of parents without a high school diploma on disciplinary infractions.

A special type of matching procedure was used by Cortes (2005), Crosnoe (2009b), and Go (2010), called propensity score matching (PSM). PSM is a two-stage estimator where in the first stage a researcher estimates a propensity score for each unit, in Cortes, Crosnoe and Go's cases, a student. A propensity score is a predicted probability that students receive a treatment based on their observable characteristics. Each treated student is matched to a "similar" student based on their propensity scores. Finally, a regression is run on the sample of matched students. A causal interpretation from this method rests on the unverifiable assumption that no unobservable variables are correlated with either the dependent variable or the probability of receiving a treatment (McEwan, 2008).

Boucher, Bramoullé, Djebbari, & Fortin (2010), De Giorgi, Pellizzari, & Redaelli (2010), Fortin & Yazbeck (2011), Lin (2010), and Patacchini, Rainone, & Zenou (2011) use variation in reference groups across individuals to analyze peer effects. These models draw on research on spatial autoregressive models in the field of urban economics, first applied to the study of social interactions by L.-f. Lee (2007b). These models first difference out group fixed effects to remove factors common to everyone in a group. The exogenous characteristics of peers then serve as instruments for average peer behavior. These methods also address the reflection problem because of the instruments used, but only if exogenous characteristics do not have direct effects. Manski (1993) is critical of these SAR models in the context of large social groups as they assume sample members know who each other are and choose their outcomes only after having been selected into

the sample. In addition, he suggests SAR models do not specify how the spatial weights matrix should change as the sample size changes.

Burke & Sass (2008) dealt the with selection problem by estimating simultaneously a set of "peer fixed effects" with individual fixed effects. This method requires multiple observations per student and multiple peer groups for each student. This approach was developed by Arcidiacono, Foster, Goodpaster, & Goodpaster (2007). The general idea requires a researcher to first estimate a fixed effect for each individual in a student's peer group, sans the student, consisting of both observed and unobserved characteristics. These estimates are then averaged together to create a single regressor that is an estimate of the mean of the fixed (gain) effects of the individual's current classroom peers. This measure is the peer effect. Burke and Sass admit their approach has limitations, as their method only produces results that are only approximately correct. In addition, estimates can be biased in the face of either weak or strong student sorting.

Grade-cohort variation.

A large number of studies have drawn from the methodology of Hoxby (2000b). In this study, Hoxby uses variation in peer characteristics in a school in grade-cohorts between years, which she suggests is credibly exogenous, to identify the effect of peer achievement and peer composition on a student's achievement. In reality, the grade-cohort method is really an example of a fixed effect model where the fixed effect is the grade cohort a student belongs to. Table 2.6 summarizes studies using this method. The next section on peer group issues delves further into this method.

Table 2.6: Grade-Cohort Studies

Bifulco et al. (2008)
Black et al. (2010)
Cabezas (2010)
Carrell & Hoekstra (2010)
Fletcher & Tienda (2009)
Friesen & Krauth (2010)
Friesen & Krauth (in press)
Friesen et al. (2010)
Gould et al. (2004)
Hanushek & Rivkin (2009)
Hanushek et al. (2003)
Hanushek et al. (2009)
Kramarz et al. (2010)
Lavy & Schlosser (2007)
Lavy et al. (2008)
Lavy et al. (2009)
Proud (2008)
Schwartz & Stiefel (2010)
Zhang (2010)

Peer Group

A final issue in relation to the estimation of peer effects involves the choice of the relevant peer group. A decision as to the peer group reflects a set of tradeoffs. I discuss these tradeoffs in this section. Table 2.7 summarizes the peer groups that researchers have used to study peer effects.

Friends are arguably the best understood and most influential peer group to children. As a matter of fact, several studies use friendship networks as the relevant peer group. According to child psychologist Willard W. Hartup (1992, p. 1): "Indeed, the single best childhood predictor of adult adaptation is not school grades, and not classroom behavior, but rather, the adequacy with which the child gets along with other children." Friendships are marked by more intense social activity, more frequent conflict resolution, and more effective task performance (Newcomb & Bagwell, 1995). As a result, one can expect the effects friends have on each other to be very strong.

Table 2.7: Choice of Peer Group

Friendship Network	Carmen & Zhang (2008)	*Grade-Cohort*	Cortes (2005)
Ali & Dwyer (2010)	Carrell & Hoekstra (2010)	Ali & Dwyer (2010)	Crosnoe & Lopez-Gonzales (2005)
Ali & Dwyer (2011)	Cho (2011)	Ali & Dwyer (2011)	Daniel et al. (2001)
Babcock & Hartman (2010)	Clark et al. (2009)	Angrist & Lang (2004)	Di Paolo (2010)
Davies & Kandel (1981)	Cooley (2006)	Bifulco et al. (2008)	Dills (2005)
Fortin & Yazbeck (2011)	De Giorgi et al. (2010)	Black et al. (2010)	Ding & Lehrer (2007)
Glaser (2009)	De Paola & Scoppa (2010)	Boucher et al. (2010)	Driessen (2002)
Halliday & Kwak (2007)	Duflo et al. (2008)	Carrell et al. (2010)	Dumay & Durpriez (2008)
Hallinan & Williams (1990)	Figlio (2007)	Fletcher (2010a)	Evans et al. (1992)
Lin (2010)	Fletcher (2010b)	Fletcher & Tienda (2009)	Feinstein & Symons (1999)
Mora & Oreopoulus (in press)	Fortner (2010)	Friesen & Krauth (2010)	Frost (2007)
Patacchini et al. (2011)	Foster & Frijters (2010)	Friesen & Krauth (in press)	Gaviria & Raphael (2001)
Pushkin (2010)	Frölich (2005)	Friesen et al. (2010)	Gibbons & Telhaj (2006)
Riegle-Crumb & Callahan (2009)	Glaser (2009)	Gould et al. (2004)	Gibbons & Telhaj (2008)
Sokatch (2006)	Graham (2008)	Halliday & Kwak (2007)	Goldsmith (2003)
	Henderson et al. (1978)	Hanushek & Rivkin (2009)	Goldsmith (in press)
Roommates	Hoxby & Weingarth (2006)	Hanushek (1972)	Hinrichs (2011)
Brunello et al. (2010)	Kang (2007a)	Hanushek et al. (2003)	Hogrebe & Tate IV (2010)
Foster (2006)	Kang (2007b)	Hanushek et al. (2009)	Imberman et al. (2009)
Sacerdote (2001)	Kiss (2011)	Hoxby (2000a)	Iturre (2005)
Stinebrickner & Stinebrickner (2006)	Lai (2007)	Hoxby (2000b)	Jackson (2010)
Winston & Zimmerman (2004)	Leiter (1983)	Jackson (2010)	Jencks & Brown (1975)
Yakusheva et al. (2011)	Levin (2001)	Kramarz et al. (2010)	Jimenez et al. (1989)
Zimmerman (2003)	Link & Mulligan (1991)	Lavy & Schlosser (2007)	Lee & Byrk (1989)
	Lott, Jr. et al. (2011)	Lavy et al. (2008)	Muller et al. (2010)
Other	Machado & Vera-Hernandez (2010)	Lavy et al. (2009)	Opdenakker & Van Damme (2001)
Bobonis & Finan (2005)	McEwan (2003)	Proud (2008)	Perry & McConney (2010)
Carrell et al. (2009)	Neidell & Waldfogel (2010)	Richards (2010)	Pong (1998)
Lu (2010)	Parker et al. (2010)	Vigdor & Nechyba (2007)	Richmond et al. (2006)
Lyle (2007)	Proud (2008)	Zhang (2010)	Rivkin (2000)
Carrell et al. (in press)	Rangvid (2004)		Robertson & Symons (2003)
	Schwartz & Stiefel (2010)	*School*	Rumberger (1995)
Classmates	Sojourner (2011)	Alvarado & López Turley (2008)	Ryabov (in press)
Aizer (2008)	Sund (2009)	Arcidiacono & Nicholson (2005)	Sakellariou (2008)
Ammermueller & Pischke (2006)	Vandenberghe (2002)	Arcidiacono & Vigdor (2008)	Schneeweis & Winter-Ebmer (2006)
Arcidiacono et al. (2007)	Vigdor & Nechyba (2004)	Asdullah & Chaudhury	Schwartz & Stiefel (2010)
Atkinson et al. (2008)	Vigdor & Nechyba (2007)	Aveyard et al. (2005)	Southworth & Mickelson (2007)
Bonesrønning (2008)	Wang (2010)	Benner & Crosnoe (2011)	Summers & Wolfe (1977)
Boozer & Cacciola (2001)	Whitmore (2005)	Berends & Peñaloza (2010)	Svensson (2010)
Burke & Sass (2008)	Zabel (2008)	Caldas & Bankston III (1998)	Syles & Musterd (in press)
Burns & Mason (2002)	Zimmer & Toma (2000)	Carrell et al. (2008)	Willms (2010)
		Coleman (1966)	Winkler (1975)

While friends have tremendous effects on each other, the similarity between friends is often the result of selection. People select each other based on whether others like them, look like them, behave like them, and think like them (Berndt, 1982; de Klepper, Sleebos, van de Bunt, & Agneessens, 2010; Hartup, 1996; Sijtsema et al., 2010). Hartup (p. 7) adds, "Similar individuals cleave to one another more readily than dissimilar individuals because they are more likely to find common ground in both their activities and their

conversations." This means that using the friendship network as the relevant peer group in statistical analyses is fraught with selection problems.

Classrooms and schools have also been used as peer groups for studies of peer effects. These groups make sense because children spend a great deal of time with each other in these contexts. Peer effects are likely to be stronger at the classroom level, as children in a classroom are more likely to interact with each other when the defined peer group is small. Children in the same classroom share the same teacher and share the same learning environment. However both classroom and school variation in peer characteristics is not likely to be random. Hoxby (2000b) argues that parents choose schools based on the population of its peers. In addition, both parents and schools can manipulate the assignment of students to classes within their grades.

As discussed in the previous section, many studies focus on the grade-cohort as the relevant peer group. This peer group is not likely to exhibit effects as strong as at the classroom level. Not all children in a grade-cohort spend interact with each other, nor do they all share the same learning environment. Lack of evidence supporting peer effects at the grade-cohort level as a result may not mean that peer effects do not exist, but exist at a more micro level. The benefit of using this peer group though is that variation between cohorts within a school is more likely to be idiosyncratic. Hoxby (2000b) argues that parents and school administrators are unable to predict changes in cohort composition, leaving this variation reasonably free of selection bias.

A few studies have examined this peer group issue. Halliday & Kwak (2007a) found that the magnitude of effect estimates vary widely by the choice of peer group based on analyses of the Add Health. The authors found that estimates based on

friendship networks had larger magnitudes than those based on grade-cohorts. The authors also suggested that school grade-cohort variation is likely to be too limited to adequately address the reflection and selection problem. This issue arose because school grade-cohorts were crude approximations of a student's actual peer network. As a result, the estimates do not capture much, if any, of the endogenous effect. They also added that grade-cohort network definitions were likely to result in weak instruments because of collinearity with school dummy variables. This study identified peer effects in both the friendship and grade-cohort peer groups based on averages of dummy variables for whether or not the mothers and fathers of the peer group members have college degrees. Their conclusions may be spurious if this instrument is not valid. The composition variables Halliday and Kwak examined were peers' smoking, drinking, and sexual behavior and educational achievement and the outcome variable was a teen's propensity to engage in like-minded behavior.

Consistent with these findings, Burke & Sass (2008) only found significant peer effects in the classroom level and not the grade level. Betts & Zau (2004) also found that classroom variation in peer characteristics was more important for reading gains, though peer lagged achievement was significant for both classroom and grade-cohort peer groups. In mathematics, only the classroom level variation appeared to be significant.

This study uses the grade-cohort as the relevant peer group because variation between and within grade-cohorts is more likely to be random than for schools for example. On a more pragmatic level, the data provided by the New York City Department of Education did not provide any information on teachers, making a classroom-level analysis impossible.

2.4. Empirical Literature on Peer Effects

I review the literature on peer effects, both exogenous and endogenous in this section. While peers have been associated with such outcomes as weight gain and obesity (Carrell, Hoekstra, & West, in press; Cohen-Cole & Feltcher, 2008; Fortin & Yazbeck, 2011; Fowler & Christakis, 2008; Halliday & Kwak, 2007b; Trogdon, Nonnemaker, & Pais, 2008; Yakusheva, Kapinos, & Weiss, 2011), smoking (Alexander, Piazza, Mekos, & Valente, 2001; Ali & Dwyer, 2010; Argys & Rees, 2008; Bifulco, et al., 2008; A. E. Clark & Lohéac, 2007; Eisenberg, 2004; Fletcher, 2010a; Garnier & Stein, 2002; Gaviria & Raphael, 2001; J. E. Harris & López-Valcárcel, 2008; Kawaguchi, 2004; Krauth, 2005; Lundborg, 2006; Nakajima, 2007; Powell, Tauras, & Ross, 2005), alcohol use (Ali & Dwyer, 2010; Argys & Rees, 2008; Bifulco, et al., 2008; A. E. Clark & Lohéac, 2007; Duncan, Boisjoly, Kremer, Levy, & Eccles, 2005; Eisenberg, 2004; Garnier & Stein, 2002; Gaviria & Raphael, 2001; Jaccard, Blanton, & Dodge, 2005; Kawaguchi, 2004; Kremer & Levy, 2003; Lundborg, 2006), illicit substance use (Ali & Dwyer, 2010; Argys & Rees, 2008; Bifulco, et al., 2008; A. E. Clark & Lohéac, 2007; Duncan, et al., 2005; Eisenberg, 2004; Garnier & Stein, 2002; Kawaguchi, 2004), cheating (Carrell, Malmstrom, & West, 2008), labor market outcomes (Marmaros & Sacerdote, 2002), sexual activity (Duncan, et al., 2005; W. N. Evans, Oates, & Schwab, 1992; Jaccard, et al., 2005; Richards, 2010), delinquency (Bayer, Hjalmarsson, & Pozen, 2009; Garnier & Stein, 2002; Henry, Tolan, & Gorman-Smith, 2001), and even church-going (Gaviria & Raphael, 2001), I focus on the

effect of peers on academic outcomes. As this study is interested in the effect of schoolmates on peer achievement, this review is limited to school peer groups.[4]

Effects from Peer Performance

I begin this review with a discussion of effects from peer performance. As performance is a behavior, it is a type of endogenous peer effect. In most cases, performance is measured using student test scores. Despite the widespread use of ability grouping or tracking in the United States, ability tracking remains a very controversial issue. An understanding of how children with different performance level affect each other is essential to resolving this issue. In addition, school choice programs likely exacerbate differences in the quality of peers students are exposed to. This review is by no means exhaustive and focuses on studies with strong research designs. I begin with the strongest research design of all: random assignment.

Natural experiments.

Higher education.

Higher education is an ideal place to study peer effects. As the assignment of students to dormitory roommates is random in many colleges, the link between the unobserved characteristics of peers and their selection into certain settings is broken. The research on peer effects in higher education is at best mixed. This may be due to the reliance on pre-admission measures of performance like SAT scores, which are at best fuzzy measures of student aptitude.

[4] An excellent review of the literature on "neighborhood effects" can be found in Durlauf (2004).

One of the earliest studies on peer effects in higher education was Sacerdote's (2001) study of roommates at Dartmouth College. Sacerdote's study found strong effects of roommate GPA on a student's own GPA in the first year of college; a one standard-deviation increase in average roommate GPA was associated with a 0.05 point increase in own GPA. However, because of the reflection problem, it is impossible to determine if the relationship is causal. He also found that a predetermined measure of roommate ability developed by the college's admissions office based on SAT score and high school rank not affected by the reflection problem did not appear to influence student GPA. G. Foster's (2006) study of roommates at the University of Maryland also did not find significant effects from roommate SAT scores and high school GPA for both men and women.

Zimmerman's (2003) results from Williams College are consistent with Sacerdote's (2001) and G. Foster's (2006) findings. This study did not find that roommate SAT score influenced a student's own first semester or cumulative GPA. However, there was a significant and positive effect from roommate SAT verbal score, a measure that Sacerdote and Foster did not examine. A 100-point increment increase in roommate's verbal score translated to a 0.03 point increase a student's first semester GPA.

Slightly different results were found by Stinebrickner & Stinebrickner (2006). These authors found that roommates did affect student GPA, but only for women. Every unit increase in roommate high school GPA was associated with a 0.176 point increase in a female student's own first semester GPA at Berea College. A $10,000 increase in roommate family income was associated with a 0.05 point increase in a female student's own GPA. Roommate ACT score however, did not have an effect on female GPA. All

three roommate characteristics did not significantly influence the outcomes of male students at Berea.

Parker, Grant, Crouter, & Rivenburg (2010) found no evidence for the presence of peer effects in core courses at three Northwestern liberal arts colleges. The dependent variable was academic success outside of the core course, as core course grades would be endogenous because of the reflection problem. The key independent variable was a predicted average cumulative GPA variable. Students were randomly assigned to these core courses and the authors controlled for core course instructor fixed effects.

Two studies by Carrell, Fullerton, & West (2009) and Lyle (2007) examined peer effects within the context of randomly assigned social groups at two U.S. military academies, the U.S. Air Force Academy in the case of Carrell et al., and the U.S. Military Academy in the case of Lyle. Despite the similarities between the two studies, the results of the two studies are diametrically opposed. Lyle found no evidence that average peer SAT score within a "company" affected a student's first-year GPA or math grade. The average SAT score of older "role models" in the company also had little effect on these academic outcomes. As in the majority of the studies reviewed in this section, Carrell et al. did not find significant effects from roommate SAT scores, both verbal and mathematics, but did find positive and significant effects from the average SAT verbal score from other freshmen in a student's squadron. The author found that a one standard deviation increase in peer SAT verbal score was associated with a 0.05 grade point increase in student GPA.

K-12 education.

There have also been some experiments involving K-12 education. Hoxby & Weingarth (2006) used school reassignment in Wake County, North Carolina to identify the effect of peer achievement and peer exogenous characteristics on student outcomes. One has to be concerned however, of the possibility that school reassignment is not random. As Hoxby and Weingarth acknowledge, the goal of reassignment in Wake County was first to equalize racial composition and then to equalize income composition. This fact suggests that the children reassigned may be different in other ways as well that are not controlled for in the regression model. The results of their study suggested that an increase of mean initial achievement by one point increased a student's own achievement by approximately 0.25 points. They also found that students in the extremes of the test score spectrum benefited from peers who had similar levels of achievement.

Cooley's (2006) study relied on the exogenous change in behavior caused by the introduction of a student accountability policy by the State of North Carolina. Her results suggest that a one standard deviation increase in mean classroom peer achievement was associated with a 0.22 standard deviation increase in a student's own reading test score. This estimate is in line with Kang (2007b). In Kang's study, a one standard deviation increase in mean peer math achievement was associated with a 0.30 standard deviation increase in a student's own math achievement. Her source of variation came from a South Korean policy that required elementary school graduates to be randomly assigned to private or public middle schools in the relevant school district.

Sojourner (2011) used data from Tennessee's Project STAR experiment, which randomly assigned students to classes of differing class size. This famous experiment has both its fair share of supporters (Krueger, 1999), and critics (Hoxby, 2000a). Hanushek

(1999) was concerned that bias had been introduced into the experiment because of non-random transfers between classes and non-random attrition out of schools. Hoxby's concern regarded the existence of Hawthorne Effects from teachers and students participating in the experiment. These concerns notwithstanding, Sojurner estimated that an increase of average lagged mean achievement of 10 percentile points in a classroom was associated with an increase in a student's first-grade achievement by approximately 2.5 percentile points.

Several authors have examined natural experiments from developing and transition economies. Duflo, Dupas, & Kremer (2008) used exogenous variation from a program in western Kenya to reduce class sizes. Students were randomly assigned to sections from this program. The results of this study suggest that a one standard deviation increase in average peer test score increased a student's own test score by 0.53 standard deviations. This result is consistent with results from L. C. Wang (2010). Wang exploited the random assignment of students into classrooms in a large secondary school in Malaysia to estimate peer effects on educational outcomes. Wang found that a one standard deviation increase in the average baseline math score of classmates results in a 0.50 standard deviation increase in a student's own math score. In addition, Wang found that high achieving peers lowered absence rates and the incidence of discipline violations. Contrary to most of the literature, he did not find evidence of non-linear effects.

Lai's (2007) study of a natural experiment in Beijing's middle schools is in contrast to most of these studies. She found little evidence that variation in initial mean peer achievement caused by within school lotteries for classroom assignment had any effect on student achievement.

Some studies have not looked at endogenous peer effects per se but have used composite identifiers for student ability or quality. This method helps address the reflection problem as these variables are not measures of behavior per se, though Moffitt (2001) suggests such estimates capture both endogenous and exogenous peer effects. Angrist & Lang (2004) for example examined a natural experiment resulting from the METCO desegregation program in the greater Boston area. These results differed from Hoxby & Weingarth (2006) in that Angrist and Lang did not find that markedly lower-performing Metco students had statistically significant effects on non-Metco students. Angrist and Lang did however find some significant and negative effects from Metco students (particularly female Metco students) on the reading and language scores of black third graders.

A similar study used the exogenous variation in peer quality caused by the influx of children into Houston and Louisiana schools resulting from Hurricanes Katrina and Rita in 2005 to identify peer effects. Imberman, Kugler, & Sacerdote (2009) found that the influx of evacuees had little impact on the achievement or discipline of native students. Only for mathematics for Houston elementary students was there a statistically significant decrease of 0.09 standard deviations resulting from a 10 percent increase in the share of evacuees in a school. A 10 percent increase in the share of evacuees was also associated with a 1.3 percentage point drop in native Houston middle and high school black natives. While the effect of evacuees on achievement is monotonic, it is also non-linear with the lowest and highest achievers affected the most.

In the same vein as Imberman, et al. (2009), Cipollone & Rosolia (2007) used exogenous variation caused by an earthquake in Italy. The earthquake resulted in an

exogenous shock to the probability of boys graduating from high school. Boys in in several cohorts living in southern Italy were exempted from compulsory military service, resulting in increased male high school graduation rates. The authors found that this exogenous increase in male graduation rates resulted in an increase in female high school graduation rates, which they ascribe to peer effects.

Dills' (2005) study is in the same spirit as the studies by Angrist & Lang (2004), Cipollone & Rosolia (2007) and Imberman, et al. (2009). The natural experiment she studied involved the introduction of a magnet school into the Fairfax County, Virginia school district. Her results suggest that the loss of high-ability students to the magnet school had a negative effect on the test scores of the children that remained. The departure of an additional one percent of high-scoring students increased the percentage of remaining students scoring in the bottom national quartile by about nine percent.

While the results of these studies are different, they generally support the notion that a high performing peer is better for a student's achievement than a low performing peer is. It may be that the high performing peer pushes an individual to perform better or creates a less disruptive environment that is conducive to learning. In addition, they suggest that these effects are non-linear, and strongest for children with test scores in the extremes.

Grade-cohort variation.

A few studies have used the Hoxby (2000b) method to study peer effects from ability. Like the original Hoxby study, Hanushek, et al. (2003) used data from Texas. Consistent with most of the literature, all students appear to benefit from having higher achieving schoolmates. The study found that a one standard deviation increase in average

lagged mathematics achievement, as a student moved with a cohort was associated with a 0.17 to 0.24 standard deviation increase in mathematics test scores.

Jackson (2010) used the cohort method to study the effects of peer quality on the number of exams secondary school students in Trinidad and Tobago passed. He argued that because students are conditionally assigned to secondary schools in Trinidad and Tobago, this source of variation is exogenous. The results suggest that a one standard deviation increase in peer mean achievement resulted in a student passing 0.085 more exams. There are 31 Caribbean Secondary Education Certification exams modeled after the British Ordinary Levels. The peer effects are 50 percent greater for females than for males. They are also greater in high peer achievement schools and at high peer achievement levels.

H. Zhang (2010) examined peer effects in Chinese middle schools. In addition to using the cohort-to-cohort variation in lagged peer achievement to identify peer effects, Zhang also instruments this variation with the lagged test score measures of new peers. This additional IV may have affected the efficiency of the estimates as this study does not find evidence of peer effects from lagged test scores, in contrast to the two previous studies.

Lavy, et al. (2008) also found that low achieving schoolmates resulted in lower performance, but also made progress on identifying the mechanisms behind ability peer effects. Lavy et al. found that the share of repeater students in a cohort was negatively associated with a wide variety of academic outcomes including matriculation test scores, matriculation status, number of credit units, number of advanced level subjects in science, and a matriculation status that meets university entrance requirements in Israeli secondary schools. Survey data the researchers analyzed suggested that a high proportion of repeater

students resulted in a deterioration of teachers' pedagogical practices, detrimental effects on the quality of inter-student relationships and the relationships between teachers and students and an increase in the level of violence and classroom disruptions.

Another study using the cohort approach by Carrell & Hoekstra (2010) looked at the effect of peers exposed to domestic violence. Carrell and Hoekstra circumvent the reflection problem by using a measure of peer quality (exposure to reported or as-yet-unreported domestic violence) not caused by peer test scores. The authors found that a one standard deviation increase in the share of such troubled children resulted in a fall in test scores of $1/40^{th}$ of a standard deviation, a finding significant at the 0.10 level. Additionally, a one standard deviation increase in the share of children from troubled families was associated with a 17 percent increase in school infractions. The effects were driven from troubled children from low-income families. Boys drove these results and also incur most of the negative consequences on achievement and behavior.

Other strategies.

Burke & Sass (2008), whose method of estimating peer effects was described previously in this chapter, found little evidence of peer effects under linear-in-means specifications utilizing data from Florida public schools. However, non-linear specifications did yield significant and sizable effects. Students in the bottom of the scoring distribution benefited the most from high-achieving classmates. In addition, high-achieving classmates had the largest positive effects on a student's own achievement.

Graham (2008) applied his method with data from Project STAR and found strong evidence of peer effects. Zabel (2008) used this method to study peer effects in New York

public schools. He found that a standard deviation increase in mean peer achievement was associated with a 0.042 to 0.075 standard deviation increase in achievement. This estimate is significantly smaller than most of the estimates in the literature.

A recent study by Ding & Lehrer (2007) argued that in contrast to education in the United States, school assignment in China is based on entrance exam scores. These cutoff scores create a natural regression discontinuity model. Their study indicated that a one percent increase in peer quality, as measured by incoming high school entrance exam scores, resulted in achievement gains that are equivalent to between 8% and 15% of a one percent increase in one's own earlier achievement. High ability children benefited most from higher ability peers.

Several studies have used the spatial autoregressive strategies described earlier in this chapter to examine endogenous peer effects. Two studies have used these methods in combination with the National Longitudinal Study of Adolescent Health (Add Health), a longitudinal study of a nationally representative sample of adolescents in grades 7-12 in the United States during the 1994-95 school year (Carolina Population Center). Both of these studies also focus on school friendship groups but focus on different outcomes. (Lin, 2010)'s analysis suggested that a one standard deviation increase in peer average GPA raised a student's own GPA by 0.221 points. Patacchini, et al. (2011) found that a one standard deviation increase in peers' aggregate years of education resulted in a roughly 10 percent of a standard deviation increase in an individual's educational attainment. Boucher, et al. (2010) used this strategy to study peer effects in Quebec secondary schools. He found that a one-point increase in the average test score of a student's peers resulted in an

increase in a student's own achievement of 0.5 in French, 0.65 in history, and 0.83 points in mathematics.

Racial/Ethnic Composition Studies

This section presents my review of research on the effects of peer group racial composition. As discussed previously, in most cases, these effects consist of both exogenous and endogenous effects. In other words, the effects examined in these studies are not inherently associated with a racial group, but also include the effects of variables associated with a racial group including family income, parents' education, and home language (Hoxby, 2000b). Arguably, the most explored area of composition effects involves racial or ethnic composition. This is not surprising as one of the main issues in Brown vs. the Board of Education was the role segregation played in the personality, motivational, educational, and professional development of African-American children. (K. B. Clark & Clark, 1947; K. B. Clark & Cook, 1988; Deutscher & Chein, 1948; Zirkel & Cantor, 2004). With a few exceptions, African-American composition appears to have negative effects on the educational outcomes of students, though the effect depends on subgroup and the concentration of African-American students.

Natural experiments.

In the Hoxby & Weingarth (2006) study described previously, the authors found that the vast majority of the impact of racial concentration was really the effect of achievement. Controlling for this endogenous effect, twenty-five of thirty coefficients are insignificant. There are some significant effects however, though they are very subgroup-

specific. A 10 percent increase in the share of his class that was black and poor resulted in a drop in achievement by 0.025 standard deviations for a child that that was black and poor. The authors also found that the share of class that was black and not poor had a positive and significant effect on white, non-poor children and that the share of class that was poor, Hispanic positively affected black, poor children and negatively affected Hispanic, poor children. Finally, poor Asian cohort composition had a negative and significant effect on white, non-poor children.

Grade-cohort variation.

One of the peer effects examined by Hoxby (2000b) was the impact of racial composition on student test scores. This study, which used data from Texas, found strong evidence that the share of third graders who were black had negative effects on the math and reading test scores of third graders. The effects were strongest on the achievement of black and Hispanic students. A 10 percent increase in the share of their class that was black reduced black students' reading scores by 0.281 points and black students' math scores by 0.114 points. Hispanic children saw a decrease of 0.293 and 0.152 points in reading and mathematics respectively, from a 10 percent increase in black composition. Native American composition had a negative effect on the reading and math test scores of Anglo students as did Hispanic composition on the reading test scores of Hispanic students. Asian composition appeared to have a positive effect on the mathematics test scores of black students.

There was evidence of multiple non-linearities in the Hoxby (2000b) study. For example, the negative effect of black share on black students was strongest in cohorts

between 33 and 66 percent black. The negative effect of black share on Anglo students was largest in cohorts that were at least 33 percent black. The sign of the Hispanic effect actually changes as Hispanic share increases. The negative effect of Hispanic share on Hispanic students only appears in cohorts that were less than a third Hispanic. In cohorts that were at least 66 percent Hispanic, the effect of Hispanic share on Hispanic children is actually positive. This finding suggests that segregation may actually be worthwhile for Hispanic students. This positive effect may owe to the increased likelihood of LEP Hispanic students finding a bilingual student to translate for them. It may also be that high concentrations of Hispanics force schools to provide ESL services or allow teachers to modify their instruction to suit the needs of Hispanic students (Hoxby, 2000b).

Hanushek, et al. (2009) published another study from Texas that examined racial composition effects. The data in this study spanned grades four through seven. The authors found that intra-student, intra-cohort variation in black share had negative effects on the mathematics achievement of both black and white students, though the effects were stronger for black students. They found no evidence of non-linearities, and no evidence of gender differences in the effect of proportion black on achievement. A follow-up study Hanushek & Rivkin (2009) found that high-achieving black children were most hurt by black composition. Proportion black had the most inimical effect on low-scoring white children in elementary school and on white children who were somewhat below the mean in middle school. In addition, Hispanic composition had positive effects on low-scoring black children in elementary school.

Bifulco, et al. (2008) used within-school variation in cohort composition to identify effects of socioeconomic status composition on student outcomes. This study using the

Add-Health did not find support for ethnic composition effects. The percentage of black and Hispanic students had little effect on either high school dropout or college attendance.

Other methods.

Lin (2010) appears to be the only study to use SAR models to identify racial composition effects. She found that a more black or other race peer group lowered a student's high school GPA. Asian peers appeared to have a positive effect on student achievement, while there was no effect of Hispanic composition.

Hoxby (2000a) used an instrumental variables strategy to estimate the effect of racial composition on student achievement. The instrument is based on natural variation in the timing and race of births. In small districts, she argues that natural population variation results in significant differences in composition between cohorts. Contrary to Hoxby (2000b), this study found no effect of black composition on student achievement.

Gender Composition Studies

This section reviews some of the literature on the effects of peer group gender composition. The study of gender composition effects has important implications for education. Proponents of same-sex education for example argue that boys and girls learn and study differently (NASSPE, 2011). If so, Cabezas (2010, p. 3) suggests that: "classroom composition could affect the curriculum and instruction needed and could call for different pedagogical approaches." The totality of studies reviewed below support the notion that on average a more female peer group is associated with positive effects on

achievement. These results are consistent with a hypothesis that girls are less disruptive than boys are.

Experimental evidence.

Whitmore (2005) used data from Project STAR to analyze the effect of gender composition on student test scores. Whitmore's results suggest that assignment to a Kindergarten class that is over 50 percent female resulted in a test score gain of 2.3 percentile points in combined reading and math test scores. The results vary wildly by grade however. Female composition has an insignificant effect in grade one, a positive effect in grade two, and a negative effect in grade three. Interactions with female also fluctuated by grade.

Grade-cohort variation.

The cohort method has been very popular in the study of gender composition effects. Hoxby's (2000b) seminal study examined gender composition among other determinants of student achievement. She found that both male and female students stood to benefit from a more female peer group in both reading and mathematics. The results suggest that female test scores rose by 0.037 points with every 10 percentage point change in the share of girls in the cohort. Every 10 percentage point increase in the share of girls in a cohort was associated with a 0.0471 point increase in the achievement of boys. In mathematics, 10 percentage point increases in female share were associated with 0.038 and 0.040 point increases in test scores, for girls and boys respectively. The effects are larger for later grades.

This method has also been applied to other nations in order to study gender composition effects. Lavy & Schlosser (2007) for example, not only attempted to estimate gender composition effects but also attempted to isolate the mechanism behind these effects using data from Israel. The researchers found that the share of female students in a student's cohort had positive and significant effects on a wide variety of educational outcomes including test scores, matriculation status, number of credit units, number of advanced level subjects in science, and likelihood of a matriculation diploma that met university requirements. Results were generally the same for male and female students. The effects of female composition were strongest when female student representation was highest. Teacher survey data suggested this effect resulted from a reduction in classroom violence and disruption and teacher fatigue and improved inter-student and student-teacher relationships and students' overall satisfaction in school. These phenomena resulted from compositional change and not improvements in the behavior of peers.

Black, Devereux, & Salvanes (2010) found somewhat different results from Hoxby (2000b) in their analysis of Norway. They also instrumented peer effect variables with the peer characteristics of one's birth cohort. They found that a more female cohort hurt the educational attainment of boys, but benefited the educational attainment of girls. A 10 percent increase in the fraction of female students reduced average completed education of boys by 0.02 years and increases the average completed education of girls by 0.014 years. The fraction of female students also reduced the probability that a male student selected an academic track, but had no effect on female students as it relates to this outcome. The effect on test scores is positive for both sexes, but not significant.

Black, et al.'s (2010) results are supported by Cabezas' (2010) study of gender composition effects in Chile. As in Black, et al., girls appear to benefit from a more female cohort in this study, while there is no effect on boys. A 10 percent increase in the share of female students in a cohort is associated with a 0.44 standard deviation increase in mathematics and half a standard deviation increase in science. The marginal effect of female composition is largest at low levels of female cohort composition. One slightly different result was obtained by H. Zhang's (2010) study of Beijing middle schools. He found positive but insignificant effects from a more female cohort composition.

Spatial autoregressive models.

The studies that have used spatial autoregressive models to estimate peer effects have found effects that are different from most of the literature. Lin (2010) found that having more females in a friendship group was associated with a lower grade point average. Likewise, Boucher, et al. (2010) also found that a more female peer group lowered achievement in French, though effects in science, math, and history were not significant. One reason may for the difference from most of the literature is that these models attempt to identify endogenous effects independent of exogenous effects.

Other methods.

Unlike her findings regarding racial composition, Hoxby's (2000a) instrumental variable strategy found significant effects from a more female cohort. She found that a 10 percent increase in the share of female students raised writing test scores by between 0.15

to 0.2 of a standard deviation. In addition, a 10 percent increase in percent female was associated with an increase in fourth grade math scores of a tenth of a standard deviation.

Socioeconomic Composition Studies

This section reviews the literature that examines the impact of peer group socioeconomic composition on student outcomes. The role of socioeconomic composition was highlighted by Coleman, et al. (1966) and remains an important area of research by researchers from multiple fields including economics, education, sociology and public policy. As summarized by Ewijk & Sleegers (2010), several mechanisms have been proposed to explain socioeconomic composition effects including: effects on the disciplinary climate or atmosphere in a class (Hoxby, 2000b); more streamlined teacher instruction (Harker & Tymms, 2004); greater parental support (Opdenakker, Van Damme, De Fraine, Van Landeghem, & Onghena, 2002) and finally greater peer competition (OECD, 2001). I define socioeconomic status very broadly in this review.

Natural experiment.

Legewie & DiPrete (2011) suggest that student assignment to elementary school classrooms in Berlin is plausibly random. The authors can make this claim because primary school regulations in Berlin prohibit the assignment of students to classrooms based on gender, first language, or performance. Socioeconomic status in this study was measured using the ISEI scale. The authors found a positive linear-in-means effect of SES composition on fifth grade reading test scores. However, the interaction of SES

composition and female was negative, suggesting that boys were more sensitive to a learning-oriented environment.

Grade-cohort variation.

Bifulco, et al. (2008) found that the average educational attainment of a student's schoolmates was positively and significantly associated with higher rates of college attendance and lower rates of high school dropout. A one percentage point increase in the percentage of students with college-educated mothers was associated with about a 0.3 percentage point decrease in the probability of dropping out of high school, and an increase in the probability of attending college of between 0.4 to 0.5 percentage points. There were no effects on an individual's post-high school picture vocabulary test in the linear-in-means model. The effects on school dropout were especially large for Hispanic students. A one percent increase in the share of students with college-educated mothers was associated with a 1.648 percent increase in the likelihood of a Hispanic youth dropping out of high school. College attendance was driven primarily by the impact of cohort composition on white students.

Black, et al. (2010) also found some positive effects from average maternal education in a cohort. Each additional year of average peer mother's education was associated with an additional 0.143 years of education for women. There was also a positive effect on the IQ scores of males. There were no effects on high school track and a positive effect on mathematics test scores for men.

Hanushek, et al. (2003) looked at the impact of cohort composition in free or reduced price lunch eligibility controlling for student and school-by-grade fixed effects.

They found a positive effect of free or reduced price lunch eligibility in this specification. However, free or reduced price lunch is a noisy measure of economic disadvantage as it is a function of both family income and school efforts to classify children as disadvantaged.

Spatial autoregressive models.

Lin (2010) found that the share of friends with mothers with more than a high school degree had a positive and significant effect on a student's own GPA. Also having a positive effect was the share of friends who lived with both parents. Variables having negative effects on achievement were the proportion of friends with mothers on welfare and the proportion of friends whose mothers are not in professional occupations. These results are consistent with Boucher, et al.'s (2010) analysis of Quebec secondary schools. The authors found that an index of socioeconomic status computed from maternal educational level and parents' job status had positive effects on French and mathematics test scores.

Together, the results of these studies strongly suggest that the socioeconomic composition of a student's schoolmates has a significant and positive effect on a student's educational outcomes, though the effect does differ by subgroup. There is little evidence supporting frog pond models that suggest that poor students may face greater competition for scholastic credentials and more stigmatization in middle-class schools than in schools with similar peers.

Other Composition Studies

At least four studies have examined the effect of the average age of peers on student outcomes. Black, et al. (2010) found no effect of average age on high school track and math test scores. They did find however that each additional year in the average age of a student's cohort was associated with a reduction in educational attainment of 0.203 years. Lin's (2010) study found a significant and negative effect of average age on a student's GPA. This study found that a one year increase in the average age of a student's peer group reduced student achievement by 0.046 points on a 4.0 scale. Elder & Lubotsky (2009) found that that having older classmates boosted a child's test scores but increased the probability of grade repetition and diagnoses of learning disabilities such as Attention Deficit/Hyperactivity Disorder. This study instrumented average age with children's predicted kindergarten entrance age if they were to begin school when first allowed by law.

Friesen, Hickey, & Krauth (2010) used the cohort method and data from students in grades 4-7 in British Columbia schools to investigate the effect of having disabled peers on value-added exam outcomes. None of the peer disability variables were significant in this study. Another study set in British Columbia and using the same methodology as Friesen, et al. from Friesen & Krauth (2010) found a positive but insignificant effect of Aboriginal concentration on the test scores of Aboriginal students.

2.5. Immigrant Composition Studies

There have been several studies that have estimated the effect of immigrant children on their classmates. A growing consensus seems to be emerging from these studies

that the effect of immigrant composition is negative. The exact mechanism behind their negative effect however, remains elusive.

Gould, et al. (2005) used the influx of recent immigrants to Israeli schools to investigate the effects of variations in immigrant enrollment share on academic attainment. This study used an IV approach to estimate immigrant composition effects. The authors instrumented the share of immigrants in a cohort with the predicted percentage of immigrants based on assigning to each child the grade he or she would have attended based on his or her exogenously determined date of birth. This variable makes sense intuitively as the predicted percentage of immigrants in a grade is likely to be correlated with the actual percentage. On face, the predicted percentage also appears to be random. Balancing tests also support the instrument's exogeneity. The instrument should address the selection problem and some correlated effects problems by introducing a random source of variation to the analysis.

The study found that the overall presence of immigrants in an elementary grade-cohort had a significant and large adverse effect on two important outcomes for Israeli natives: the dropout rate and the chances of passing the high school matriculation exam, which is necessary to attend college. A 10-point increase in the percentage of immigrants in fifth grade raised the dropout rate of native students by 1.4 percentage points and lowered the individual matriculation rate by 2.7-3.2 percentage points. There were no effects on more immediate outcomes like the quality of high school attended.

Betts & Fairlie (2003) were interested in the effect of immigration on the enrollment of native students in public schools. Controlling for metropolitan fixed effects within a first differences model, the authors found no effect of immigration on native

enrollment in elementary school. However, the analyses of 1980 and 1990 Census data did suggest that for secondary school students, every four immigrants who entered American public high schools were associated with one native student switching to a private school. This "native flight" phenomenon was driven by the effect of non-English speakers at home on white students.

Cortes (2005) looked at the impact of enclave schools on the academic performance of the children of immigrants. This group included both first-generation and second generation immigrant children from the major immigrant-receiving cities of San Diego and Miami. Enclave schools were defined as schools where more than 25% of the interviewed sampled were born abroad. Cross-sectional regressions that controlled for a set of individual and family, nationality, and school characteristics suggested a positive effect from attending an enclave school for children who have been in the United States 5-9 years but only in the Miami sample. However, regressions using a propensity score matching method did not report significant results.

Crosnoe & Lopez-Gonzales (2005) examined the impact of immigrant school composition on the outcomes of Mexican youths using data from the Add Health. Cross-sectional regression results from this article suggested that the proportion of first- and second-generation immigrant youths in a school largely did not predict either academic failure or risk of obesity of children of Mexican heritage. There was some evidence though that immigrant composition affected the outcomes of second generation Mexican-American youths.

Several studies have used the Programme for International Student Assessment (PISA) to examine immigrant composition effects in an international context. Controlling

for country fixed effects, Giorgio Brunello & Rocco (2011b) found that the share of first-generation immigrant pupils in a school reduced the school performance of 15-year old native children. The article found that a 10 percent increase in the share of first-generation immigrant pupils in a nation was associated with a 0.238 percent decrease in the student test scores of native youths. The effect was larger for females and natives from disadvantaged backgrounds, as measured by the number of books a student's household owned. The results were similar if the immigrant composition variable included second-generation immigrant youths.

Another study by Di Paolo (2010) also used data from the PISA. This study used an alternative sorting mechanism to address endogeneity issues. The author used a predicted linear score to obtain a proxy of parental education; this score was then used to sort students into reference and non-reference groups. This score was generated based on an ordered probit model that estimated the probability of membership in each quintile of a schools' average parental education. Based on this analysis, the author found that immigrant composition in Spain was negatively associated with science test scores, though the estimate was not significant. These results differ slightly from another study on Spanish immigrant composition by Cebolla-Boado & Medina (in press). Using Spanish survey data in combination with school random effect models, the authors found no relationship between the share of immigrants in a school and mathematics test scores once controlling for observable characteristics.

The PISA was used to study the effect of immigrants, defined as youths whose parents were both born abroad, in European countries on both immigrants and native-born youths (Entorf & Lauk, 2008). The results of cross-sectional regressions used in this study

suggest that the impact of average native-born achievement within a school had a stronger effect on the achievement of both natives and migrants than average immigrant achievement in a school. These results were strongest for countries with non-comprehensive schools as in Austria and Germany and Central and Eastern Europe. Immigrant achievement also had significant effects for both native and immigrant students in the traditional immigration countries of Australia, Canada, and New Zealand and for natives in Austria and Germany.

The effect of English language learners on non-English language learners was the main interest area of Cho (2011). Her results indicated that having an ELL peer in a kindergarten and first grade class decreased the reading test scores gains of non-ELL classmates by 0.004 to 0.006 standard deviations. The results were driven by students whose annual household income was $25,000 or less. She did not find significant effects in mathematics. This study used data from the Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K) and controlled for individual and school fixed effects. This finding is consistent with a study of German students by Bellin, Dunge, & Gunzenhauser (2010). Using data from the Progress in International Reading Literacy Study and hierarchical linear modeling, the authors found that a 10 percent increase in the share of children in a classroom who did not speak German at home reduced reading test scores by 0.08 standard deviations.

Friesen & Krauth (in press) found Punjabi home-language cohort composition was negatively associated with mathematics test scores. The authors employed a value-added model in combination with school fixed effects to estimate these composition effects. A 10 percent increase in the share of Punjabi-language peers was associated with a 0.045

standard deviation decrease in mathematics test scores. On average, Chinese composition was associated with higher test scores, but the results are not robust and insignificant in many specifications. Very few of the interaction terms between ethnicity and peer ethnicity were significant. This study used data from British Columbia.

Svensson (2010b) did not look at the effect of immigrant composition on test scores, but on alcohol use. Set in Sweden, this study focused on the outcomes of junior high school students. Controlling for school random effects, the author found both the shares of Swedish and non-Swedish peers reporting alcohol were positively associated with alcohol use by Swedish students. The proportion of non-Swedish children who reported using alcohol in a school also had positive effects on alcohol use by non-Nordic European and non-European first- and second-generation immigrants but not on immigrants from other Nordic countries. Binge drinking by Swedish and non-Swedish schoolmatesalso had a positive effect on binge drinking by Swedish students. The share of non-Swedish schoolmates who engaged in binge drinking however, did not affect the binge drinking of the first- and second-generation immigrant children in Sweden.

Two studies, by Betts (1998) and Hoxby (1998) examined the impact of immigration on the educational outcomes on minorities. The authors argue that native minorities are an important treatment group for both K-12 and higher education students. Betts argued that minority families were less able to move to more affluent areas if an influx of immigrants put a strain on local public services. In addition, tracking within schools may mean immigrant children and minority children are grouped together in the same classes because of similar levels of achievement. In higher education, immigrants are likely to compete with native minorities for scarce financial aid and through affirmative

action, as affirmative action programs do not distinguish between native and non-native members of the same racial or ethnic group (Hoxby, 1998).

Betts (1998) used data from the Census of Population and Housing to estimate the impact of immigration on the educational attainment of native-born African-Americans and Hispanics. These regressions controlled for state fixed effects. The results of this study suggested that a one percentage point increase in immigrant composition within a state reduced the likelihood of a native-born black aged 19 to 25 attaining at least 12 years of schooling by 0.25 percent. The crowd-out of native-born Hispanics from immigration was even larger than the crowd-out for Blacks. Every percentage point increase in immigrant composition was associated with a 0.58 percentage decrease in the likelihood of a native-born Hispanic aged 19 to 25 attaining at least 12 years of schooling. The Hispanic results were driven by California residents while the African-American results were more of a national phenomenon.

Hoxby (1998) exploited variation from a natural experiment in California to estimate the impact of immigrant composition on the share of disadvantaged and minority native youths attending college. This variation came as a result of a 1990 court case that allowed the University of California system (UC) and the California community college system to charge foreign-born students out-of-state tuition. The California state college and university system (CAL-STATE) however, continued to charge immigrant students the much lower in-state rate. This resulted in an influx of students into the CAL-STATE system, and a potential instrument. Using the National Postsecondary Student Aid Survey (NPSAS) as her data source, the results of her study suggest that foreign-born students crowded out black, Hispanic, and low-SES natives in very selective colleges.

An article by Borjas (2004) also found crowding out by immigrant students at the higher education level. Borjas investigated the effect of foreign students on native students in graduate programs. Pooling data from the Integrated Postsecondary Education Data System (IPEDS) and its precursor the Higher Education General Information System (HEGIS), and controlling for university and year fixed effects, Borjas found no relationship between foreign graduate enrollment and native graduate enrollment. However, there were different effects for different racial groups. Each additional foreign graduate student within a university was associated with a 0.418 decline in white native men within a university. The crowd out effect was strongest at the most elite institutions.

One study that contradicted most of these findings was by Conger (2011).Conger's study suggests that both native-born and foreign-born students benefited from immigrant cohort composition. Her results suggest that a 10 percent increase in the share of foreign-born students in a grade-cohort was associated with a 0.02 standard deviation increase in mathematics test scores. Results were similar for foreign-born and native-born students. These results came from models that controlled for a set of school characteristics and a prior year test score. Regressions that added individual fixed effects however, produced immigrant composition coefficients that were approximately zero and not significant.

This study used data from Florida, where immigration is predominantly Latin American (and to a slightly lesser extent, Cuban) in character (U.S. Census Bureau, 2000). Cuban-American families are wealthy relative to other Hispanic groups. Only 15 percent are below the poverty line, versus 28 percent for Dominicans and 25 percent for Mexicans. In addition, children with Cuban heritage have higher test scores on average than other Hispanic groups (Reardon & Galindo, 2006). These favorable attributes may have

something to do with Cuba's education system. Virtually the entire population of Cuba is literate, despite a gross domestic product that is significantly below the United States and Canada (Uriarte, 2002). Because of these factors, it is unclear how generalizable Conger's results are to other immigrant groups.

Preliminary research from Schwartz & Stiefel (2010) looked at this issue of immigrant composition effects using data from New York City. Controlling for school-by-grade fixed effects, the authors found little to no effect of immigrant share on student outcomes. In general, the research suggests that immigrant children have either little or negative effects on their classmates. The question remains however if the peer effects of individual immigrant ethnic groups are different. It maybe that because there is so much heterogeneity in immigrant groups in New York City that any effect is washed out. In addition, Schwartz and Stiefel did not test for various mechanisms nor do they control for a wide set of overlapping fixed effects as this study does.

Mechanisms are important to social science because to truly establish causation, the earlier event that triggered a change must be established or at least suggested (Elster, 1989). Controlling for a large set of fixed effects is important because of the presence of unobservable variables. These unobservables may be differences between schools like a particularly effective principal that do not change over time. They may be changes in curriculum that affect all schools within a single year. Finally, they may be differences in ability. This can be important if high-ability students select into schools with large immigration populations.

2.6. Summary and Discussion

This chapter has emphasized the daunting task of estimating the effects of peers. The three main challenges to the estimation of peer effects are the reflection, correlated effects, and selection problems. Nevertheless, it has also demonstrated the tremendous progress that has been made in this area of research, making peer effects research one of the most interesting issues in the economics of education. The implications of peer effects for policy are widespread and our understanding of the roles they play is quickly growing. The issue of ability tracking is intimately related to peer effects from student performance. Do high performing students perform better when they are surrounded by similar children? Would average or low-performing pupils perform better if they were placed with higher performing peers? How much should we care about segregation? What are the consequences of having schools comprised mostly of African-American children, or children from low-SES backgrounds, or even children born in other countries? These are all issues related to the study of peer effects.

Overall, the research appears to have reached a consensus on a multitude of issues. In general, a high performing peer group appears to have a positive effect on a student's own achievement. In addition, a number of studies have suggest that student composition can affect student outcomes. Measures of student composition, consisting of both exogenous and endogenous effects, as the share of minority students or share of low-SES students also explain much of the variation in student outcomes.

These measures of student composition include immigrant composition. Indeed, a few studies have estimated the effect of immigrant composition on academic outcomes. Most of these studies finda negative effect from immigrant composition. This study

however is unique in several ways. It acknowledges the differences between immigrants, instead focusing on the effects of individual immigrant groups. This is important as the diversity between immigrant groups far exceeds the diversity within immigrant groups. An aggregate measure of immigrant status may disguise important differences between these groups. It is set in New York City, arguably the ideal place to study immigration in the world. Immigrants from throughout the world live in New York City and attend New York City schools. This heterogeneity provides adequate numbers to study the effects of individual immigrant groups. Finally, it uses panel data techniques to isolate the effect of immigrant composition on student achievement. The next chapter employs the research presented in this chapter in the development of an empirical model for estimating immigrant peer effects.

Chapter 3

DATA AND METHODOLOGY

This chapter brings the focus of this dissertation to my own study of immigrant composition effects. I begin by presenting the setting of this study, New York City. In this section, I present some background on the New York City school district, school choice, the examinations that students must pass in order to be promoted, and most importantly, the nature of immigration in the city and its public schools. This information is necessary to understand the institutional factors involved in producing student test scores in NYC. Section two presents the data used in this study, data that come from the New York City Department of Education. Section three describes the empirical strategy I use to estimate immigrant composition effects. This strategy consists of estimating a set of overlapping fixed effects. Section four discusses some of the limitations of this study. Section five summarizes and concludes.

3.2. Setting

With about 1.1 million students and 1,600 schools, the New York City school system is the largest in the United States, by far (New York City Department of Education, 2010a). For the purposes of comparison, there are more children attending New York's public schools than there are people living in the entire city of San Francisco. Its size makes it both a case study for school reform for urban areas in the United States and a case study for what is wrong in urban public education.

Background

In 2002, New York City Mayor Michael R. Bloomberg became the first mayor in 33 years with control over the sprawling New York City public school system. Almost immediately, he began an overhaul of the system. Among his first moves was to appoint Joel I. Klein, a former prosecutor in the United States Department of Justice, and an individual from outside the education community, as Chancellor. Together, the two men have sought to incorporate principles of management in the private sector to the city's school system.

Among the reforms have been a standardized reading and math program for most schools, the end of social promotion for grades three, five, and seven, an enhanced summer school, Saturday sessions for failing students, a principal training academy, and the replacement of the city's largest high schools with new small high schools. During this period, New York City children have shown considerable improvement on statewide examinations but their improvement on national exams has been more modest (Brunius, 2005; Hernandez, 2009; Herszenhorn, 2005a, 2005b; Medina, 2009; Merrow, 2005).

School Choice

As presented in the previous chapter, selection is a major issue when it comes to the estimation of composition effects. As a result, information about how students select into schools is important to developing an identification strategy. This section presents some background as to the school choice processes that exist in New York. This discussion is conditional on choice of residence, which is the primary school assignment mechanism.

There is relatively little school choice at the elementary school level in New York City. Elementary school students are assigned to a school via community school districts (CSD) based on two proofs of residence. However, students who have been enrolled in a year two Title I School in Need of Improvement or School Under Registration Review according to criteria set by New York State, under the No Child Left Behind Act (NCLB), are eligible to apply to transfer. Students in the last grade of their school are not eligible to transfer. Parents must then submit a transfer application form, listing their choice of receiving schools. Students are matched to schools in accordance with NCLB, which requires that the lowest-performing and lowest-income students have first priority. Students are not guaranteed a transfer though, as transfers are based on the availability of seats at each school (New York City Department of Education, 2009a, 2010d, 2010f).

There is somewhat more choice at the middle school level. Many, but not all, community school districts offer middle school choice. Each middle school sets its own admission criteria, which may include diagnostic tests, student interviews or a review of grades and test scores. Students residing in the same community school district as the school have priority. Middle school choice is encouraged by free MetroCards (the fare card for New York City Transit) for students living far from their schools (New York City Department of Education, 2009b, 2010c). In addition, middle schools are subject to the same NCLB choice provisions as elementary schools.

Charter schools are an additional form of school choice for students and parents in New York. At the end of the 2008-2009 school year, there were 78 charter schools serving roughly 24,000 students in New York City. The first charters schools in New York City

opened in the 2000-2001 academic year. According to New York City Department of Education (2010b),

> Charter schools are publicly funded and open to all students in New York City through a non-discriminatory admissions lottery. Each charter school is governed by a not-for-profit board of trustees, which may include educators, community members, and leaders from the private sector. Charters have freedom to establish their own policies, design their own educational program, and manage their human and financial resources. Charter schools are accountable, through the terms of a five-year performance contract, for high student achievement.

Three agencies are allowed to authorize charter schools: The State University of New York Charter Schools Institute, the Chancellor of the New York City Department of Education, and the New York State Board of Regents. Charter schools select their students through the use of a lottery. Students not selected are placed on a wait list. Students living in the same CSD as the charter school applied to are given priority (New York City Charter School Center, 2009; New York City Department of Education, 2010b).

This discussion of school choice suggests that some schools may be more attractive to some students than others may. In other words, there is a selection effect occurring. This could be troublesome for my estimates of immigrant composition if immigrant composition was correlated with the presence of high or low performing students resulting from school choice programs. A clean estimate of immigrant composition effects must be purged of this source of bias.

The Examinations

Test scores are the main and only measures of student outcomes this study examines. Changes in either the structure or administration of the exams can affect the internal validity of this study. This section presents background on the testing regime in New York City schools.

The federal No Child Left Behind Act of 2001 required all states beginning in 2003 that receive federal funding, including New York, to test students in grades 3 through 8 in English language arts (ELA) and mathematics in order to measure whether schools and districts were making adequate yearly progress in achieving state standards. According to the New York State Department of Education:

> For the English Language Arts Test, students are tested on their reading, listening, and writing abilities by reading and listening to passages and answering questions based on those passages.
>
> For the Mathematics Test, students solve problems and demonstrate an understanding of basic concepts and procedures. They must often support their answers by showing the steps they used to solve problems and by explaining the mathematics processes and concepts involved. (CTB/McGraw-Hill LLC, p. 3)

The ELA exam is administered each winter and mathematics exam is administered in late winter and early spring (New York City Department of Education, 2010h).

The scheduling of these exams can be problematic for this study. The measures of student and school characteristics are collected in the beginning of the academic year, while the exams are given in the middle of the year. Cohort composition may have changed between these two periods. It may also be that the effect of immigrant composition is different in the middle of the year from the end. The effect may be strongest when students are first exposed to the immigrant children, and dissipate by the end of the year. Or, it may be that the effect is felt only after a whole year.

Students in grades 3, 5, and 7 must score a Level 2 or higher on both exams in order to advance to the next grade level. Students with disabilities must also take these exams and are subject to the promotion criteria described above if they have standard protection criteria listed on their individualized education plan. Students with "modified protection criteria" are promoted based on those modified criteria. These criteria also apply to English

Language Learners who have been in an English language school system for at least three years unless they have an approved extension of services. ELLs who have been enrolled in an English language school system two to three years are promoted based on comprehensive assessment of students' class work, statewide mathematics test results, and attendance (New York City Department of Education, 2010e).

Students and parents are presented two sets of scores in their test results. These scores are called scale scores and performance levels. Scale scores are the number of correct answers on an exam converted to scores on a common scale so that achievement can be compared across grade levels. The intervals of the scale score are equal. There are four proficiency levels that indicate proficiency levels that indicate mastery of the knowledge and skills (New York City Department of Education, 2010g).

As of the 2005-06 school year, New York City students took state exams in ELA and mathematics. Previously, state tests were administered in Grades 4 and 8 and citywide tests were administered in Grades 3, 5, 6, and 7. This change in exams can have potentially large implications for this study's estimation strategy. The estimation method discussed later in this study relies on small year-to-year perturbations in immigrant share and test scores to identify immigrant composition effects.

The change in exam structure can potentially introduce bias into the random year-to-year variation in test scores if different students respond differently to the change in exam. For example, if the exam became more difficult between 2000 and 2001, and between the same two years, there was a large influx of immigrant students, the estimate of immigrant composition may be biased.

Immigrants in New York Public Schools

The diversity of backgrounds of immigrants in New York City is remarkable in terms of country of origin, educational background, occupation, and other characteristics. This section begins with a discussion of immigrants in the United States and New York City before moving on to a discussion of immigrant students in the New York City public school system.

While on average, adult immigrants in the United States are better educated than other individuals in their home countries, they tend to be clustered at both ends of the socio-economic spectrum. Some groups, particularly from Asia, tend to be better educated than native-born city residents, while substantial shares of immigrant groups from Latin America, the Caribbean, and Mexico arrive without competency in English or a high school diploma. Unemployment rates among these groups tend to vary along these educational lines (Rosen, Wieler, & Pereira, 2005). This bifurcation is in part reflective of larger American immigrant policy which has admission preferences for individuals holding advanced degrees in addition to an estimated 10 million undocumented aliens who overwhelmingly work in low-wage industries (Congressional Budget Office, 2006).

Contrary to popular perceptions, New York City is not the nation's largest immigrant center. Miami, Florida is the nation's largest immigrant center. 58.1% of Miami's population is foreign-born, according to the American Community Survey. However, the overwhelming share of the foreign-born residing in Miami is from Latin America. New York City immigrants on the other hand come from virtually every part of the world, though Latin America remains the largest sending region. 17.4% come from Europe and over a quarter come from Asia.

The diversity among New York's immigrants is also reflected in the city's public schools. Conger, Schwartz, & Stiefel (2003) estimated that about 16 percent of the 600,000 elementary and middle school students that attend New York's public schools are immigrants, and approximately 43 percent of these immigrants are classified as recent immigrants, immigrants that have been in the United States for less than three years. While immigrant students in New York come from 192 countries, most come from 15 countries, with the largest group (19 percent) hailing from the Dominican Republic.

Not surprisingly, according Conger et al.'s (2003) calculations, immigrant students are more likely to have limited English proficiency (LEP) than native-born students. Almost half of recent immigrant children are LEP compared to 19.2 percent of non-recent immigrant children. We also know New York City's foreign-born public school children are as a group not especially segregated from their native-born counterparts (Ellen, O'Regan, Schwartz, & Stiefel, 2002). The aggregate measure of immigrant children does disguise some within group differences though. For example, the typical immigrant child from the former Soviet Union attends a school with peers who are less likely to be poor, more likely to be white, have stronger English skills, and achieve average standardized test scores that are significantly above the citywide average. On the other side of the spectrum, is the typical Dominican immigrant student, who attends schools with peers (immigrant and non-immigrant) who are virtually all poor, Black and Hispanic, and more likely to have problems with English. Race and class, rather than immigrant status, tend to be the main drivers of segregation in New York public schools (see Table 3.1).

Table 3.1: Segregation and Exposure of Students 1998-1999

Origin	Dissimilarity Index	Corrected dissimilarity index	Exposure to native-born	Isolation index
Native-born	0.328	0.328	0.854	0.854
Foreign-born	0.328	0.328	0.763	0.237
Recent immigrant	0.306	0.308	0.767	0.117
Limited English skills	0.376	0.394	0.75	0.106
Six largest regions of student birth				
Dominican Republic	0.483	0.545	0.803	0.105
Mexico, Central America, or Spanish South America	0.405	0.424	0.758	0.071
Other Caribbean	0.498	0.564	0.811	0.093
Former USSR	0.504	0.778	0.669	0.175
South Asia	0.441	0.608	0.723	0.066
China, Taiwan, Hong Kong	0.471	0.702	0.696	0.134
Non-white	0.677	0.683	0.841	0.904
Free or reduced price lunch eligible	0.556	0.570	0.836	0.904
Excerpted from Ellen et al. (2002)				

3.2. Data

The data for this study come from the New York City Department of Education. It is a panel dataset with data from the 2002-2003 to 2007-2008 school years. The strength of the data is that I am able to track individual students and schools over time. The format of the data allows for the identification of multiple cohorts, which is essential to my identification strategy.

Table 3.2 illustrates graphically the structure of the data. Each letter represents a separate cohort. Cohort A begins in third grade in the 2002-2003 school-year and complete the eighth grade together in 2007-2008. Cohort B starts third grade in 2003-2004 and finishes the seventh grade in 2007-2008. In reality however, the data are far more complicated. Many students enter cohorts at different grades and in different schools.

Table 3.2: Description of Data

	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008
Grade 3	A	B	C	D	E	F
Grade 4	G	A	B	C	D	E
Grade 5	H	G	A	B	C	D
Grade 6	I	H	G	A	B	C
Grade 7	J	I	H	G	A	B
Grade 8	K	J	I	H	G	A

3.3. Regression Design

This study draws on the long literature on education production functions, as developed by Hanushek (1979, 1986) among others. Production functions in education as in microeconomics attempt to link inputs to outcomes. In an education production function, the inputs include teachers, schools, and even the students themselves. Certain inputs, the characteristics of districts, schools, teachers, etc., are in the control of policy makers. Other inputs, the ability of students, family background, are not directly controllable, though they no doubt also play a role in explaining student outcomes. More specifically, they include what the students bring to the table, their ability and their previous educational experiences are just two examples. The most typical outcome used in an education production function is a test score. While test scores are not a complete measure of learning, test scores have been positively associated with wages later in life. In addition, test scores often serve as the focal point in accountability systems and are carefully scrutinized by parents, educators, policymakers, and members of the media (Hanushek, 2002).

Equation 3.1 is a linearized education production such as that presented by R. Ferguson & Ladd (1996) and Bifulco, Duncombe, & Yinger (2005).

$$Y_{igjT} = \alpha X_{igjT} + \beta I_{gjT} + \gamma R_{gjT} + \beta I_{gjT} * \gamma R_{gjT} + e_{igjT}. \quad (3.1)$$

In equation (3.1), *Y*, a test score for student *i* in grade *g*, in school *j*, in year *T*, is a function of a vector of explanatory variables *X*, including both student and school characteristics, the share of immigrant students *I*, a dummy variable for a repeater student *R*, an interaction term between immigrant share and repeater student $\beta I_{gjT} * \gamma R_{gjT}$, and a stochastic error term *e*. *I* is the variable of interest in this study, representing the share of East Asian immigrants in grade *g*, in school *j*, in year *T*. This production function reflects the fact that multiple levels of schooling as well as student background affect student outcomes.

Students who repeat grades experience large changes in cohort composition as they switch cohorts by being in the same school, in the same grade, in different years. To ensure that these students are not driving the results of this study, a dummy variable is included that is coded 1 the year a student repeats a grade. This dummy variable is also interacted with immigrant composition to control for possible differences in the effect of immigrant composition on student test scores for repeater students. Immigrant composition is centered around its mean to allow for easier interpretation of interaction and main effects.

If *I* was uncorrelated with *e*, ordinary least squares regression would yield unbiased estimates of the effect of immigrant composition on student achievement. However, as discussed previously, this assumption is not likely to hold. The problem arises because immigrant children are not randomly assigned. Rather their presence reflects a complicated set of decisions by families and schools. Equation (3.2) decomposes the error term from equation (3.1) into a set of constituent components:

$$e_{igjT} = \theta_{jg} + \eta_{gT} + \sigma_i + \varepsilon_{igjT}. \quad (3.2)$$

Equation (3.2) has the error term in equation (3.1) as a function of a school-by-grade fixed effect θ, a grade-by-year fixed effect η, an individual fixed effect σ, and a random error term ε. Controlling for the school-by-grade fixed effect controls for differences between schools and neighborhoods and between grades within a school that are constant over time. This excludes students who switch schools from identifying the effect of cohort composition, as these school-switchers are not likely to be a random selection of students. Perhaps more importantly, cohort composition changes resulting from school switching is also not likely to be random.

In some specifications, I also control for school-by-grade specific trends. Equation (3.3) adds to equation (3.2) the school-by-grade specific trend term:

$$e_{igjT} = \theta_{jg} + \eta_{gT} + \sigma_i + \theta_{jg}\chi_t + \varepsilon_{igjT}. \quad (3.3)$$

In equation (3.3), $\theta_{jg}\chi_t$ is an interaction between each school-by-grade fixed effect term and a continuous year variable that begins at zero and increases by one for successive years. These school-by-grade specific linear trends control for the possibility that immigrant composition varies systematically with student achievement for a school-grade over time.

These types of trends are problematic for the estimation of composition effects because they may affect decisions by parents or teachers. If teachers for instance, view immigrant composition positively and immigrant composition is growing over time, later cohorts would see increase in achievement driven by improvement in teacher quality and not immigrant composition. In addition, the neighborhood where a school is located may be gentrifying or declining at the same time its immigrant composition increases. Controlling

for the school-by-grade specific linear trend would prevent neighborhood change from biasing the estimated effect of immigrant composition.

In addition to controlling for a set of school-by-grade fixed effects, I also control for a set of grade-by-year fixed effects. This has the effect of controlling for year-to-year differences that are common to a particular grade. For example, if the New York City Department of Education introduced a new exam only for the eighth grade in 2004, controlling for grade-by-year fixed effects would remove the effect of this change in curriculum on student achievement to the extent that it affects all students in the same way during a year. The grade-by-year fixed effect in essence adjusts test scores for year-to-year differences due to changes in the exam or difficulty of the exam.

Finally, I control for a set of individual fixed effects. An individual fixed effects model estimates a separate intercept for each individual. The individual fixed effects estimator controls for all of the fixed differences in students, like ability, and perhaps family structures that do not change over time, instead relying on intra-student, intra-cohort variation in immigrant or peer share to identify the effect of immigrant concentration and peer quality on achievement. In this sense, individual fixed effects are a strong solution to problems of selection. This protection against unobserved heterogeneity however comes at cost.

Controlling for individual fixed effects requires estimating a separate dummy variable or coefficient for each student, greatly increasing the number of degrees of freedom used in the regression and reducing the precision of estimates. Individual fixed effects estimation relies solely on within-student, between-year variation in immigrant share for identification, as in a difference model. This greatly reduces the variation in

immigrant share and other explanatory variables (the variation between students), further reducing the precision of estimates. These concerns are less of an issue for this study however, as there are many observations that are used, and several significant findings.

3.4. Limitations

While the controls addressed in the previous section provide powerful controls against endogeneity, limitations remain to this study. For both Dominican immigrant and East Asian immigrant composition, the average share in a cohort is less than two percent. As a result, the variation that is identified in these analyses is based on random fluctuations around a mean of two percent. This has important implications for issues of external validity. It is not clear if the immigrant composition effect identified in this study is equivalent to the effect seen if a school saw a sudden large influx in immigrant students.

In addition, the data is structured so that students are identified by the grade in which they are tested. In other words, a student taking the mathematics exam for sixth grade may be exempt from taking the English exam. As a result, the student is in a cohort in the former case and not in a cohort in the latter case. To address this issue, students are considered to be part of a grade-cohort if they take either exam. This choice creates some construct validity issues as there is some error in the assignment of students to grade-cohorts and the creation of cohort composition variables.

As the data are limited to sex, free or reduced price lunch, special education, and limited English proficient status, test scores, and country of origin, the ability to comprehensively test various hypotheses related to mechanisms is limited. Finally, theory suggests that the experiences of children of immigrants should be similar to experiences of

immigrant children. Zhou (1997) argued that both immigrant children and the children of immigrants lack meaningful connections to their "old" world. This situation distinguishes these children from their parents. Instead, these children tend to evaluate themselves according to the social norms of their new country. In addition, both groups of children have access to the social capital that belonging to their ethnic group entails. Both a Chinese child born in the United States or who immigrated the United States would be able to attend supplementary education in a Chinese enclave, for instance.

There is also reason to believe that the experiences of recent immigrant children and their effects are different from the experiences and effects of children who immigrated to the United States early in their lives. The dataset I am using unfortunately does not have information on parental country of origin or year of arrival, which is crucial to studying these issues.

3.5. Summary and Conclusion

New York City provides an exciting and rich place to study immigrant composition effects. The dataset I am using from the New York City of Department of Education is in many ways just as rich and exciting. As the dataset has information about every student in New York City public schools between the grades of three through eight for five years, the number of observations in the dataset is enormous. The enormity of the data allows one to estimate very precise coefficients even in the face of controlling for large sets of fixed effects. This feature is very important as fixed effects are at the center of the identification strategy of this study.

I control for a set of overlapping fixed effects to estimate the impact of immigrant composition on student achievement. These fixed effects allow a researcher to control for characteristics of students or schools –observed and unobserved—that do not vary over time, and provide powerful protection against endogeneity. Nevertheless, this study still has some limitations, namely lack of variation in the immigrant composition variable, measurement error in the immigrant composition variable and the absence of many important variables. Still, the data are sufficient to make an important contribution to the literatures in both immigration and peer effects.

Chapter 4

EAST ASIAN IMMIGRANT COMPOSITION EFFECTS

East Asian immigrants, individuals born in China, Japan, and Korea are in a sense one of America's main immigration success stories. The foreign-born from this region are among the most educated and wealthiest of immigrant groups (Larsen, 2004). The success of these immigrant families is reflected in the success of their children.

The literature has consistently demonstrated that East Asian immigrant children have performed well in American schools (Conger, et al., 2003; Hao & Bonstead-Bruns, 1998; Schwartz & Stiefel, 2006). To explain this phenomenon, much of the media and academic research has focused on a specific worldview immigrant families bring from East Asia that emphasizes hard work and education. These values are reflected in the behavior of children inside classrooms. Hence, there is reason to believe that East Asian immigrants may have distinctive effects on school and classroom environment as well as more direct influences on their classmates.

This chapter begins by reviewing the empirical and theoretical literature on East Asian immigrant achievement. The empirical literature has consistently demonstrated that East Asian immigrant children are performing quite well in the United States. Their performance distinguishes them from immigrant groups. A comprehensive review of the literature on East Asian immigrant children suggests three possible explanations for their strong educational outcomes. These explanations are the model minority hypothesis, community forces, and the role of peers.

Section two suggests that there are aspects of these children's lives that make them unique that may have implications for the effects they have on their schoolmates. Section three uses the information gleamed in the previous section to develop a set of testable hypotheses regarding mechanisms and interaction effects. The mechanisms this study examine are camaraderie, good behavior, and resource diversion. Delving further into the resource diversion hypothesis, I also examine the role played by language difficulties in explaining an East Asian immigrant composition effect.

Section four presents the variables used in this analysis and descriptive statistics. Section five presents the results and the results of a balancing test that investigates the possibility of selection. Consistent throughout all of the analyses in this section is a negative coefficient on the East Asian immigrant composition variable including for most subgroups. But this coefficient is somewhat misleading as the addition of other composition variables creates a very different set of results.

4.2. Why Are East Asian Immigrant Children Different?

I begin with this discussion of the performance of East Asian immigrant children because their high level of achievement and the explanations that have been offered for it suggest that East Asian immigrant children may have distinct effects on their peers. Several studies have looked at the educational achievement of East Asian immigrant children. These studies have generally found beneficial effects of East Asian immigrant status. This section reviews the empirical literature on East Asian immigrant achievement before delving into explanations for the observed behavior.

Empirical Literature on East Asian Immigrant Achievement

Without adjusting for observable differences between East Asian immigrant children and other children, several studies have found wide-ranging benefits to East Asian immigrant status in reading (Han, 2006; Hao & Bonstead-Bruns, 1998; Schwartz & Stiefel, 2010), mathematics (Han, 2006; Hao & Bonstead-Bruns, 1998; Y. Zhang, 2001), science (Zhang), and grade point average (Hao & Bonstead-Bruns, 1998; Pong & Hao, 2007; Y. Zhang, 2001).

These studies however do not control for observable differences between East Asian foreign-born children and other children. Studies using multiple regression have generally found that East Asian immigrant children continue to have advantages in mathematics and science and grade point average though at smaller magnitudes than the results without adjusting for observable differences (Hao & Bonstead-Bruns, 1998; Kao & Tienda, 1995; Pong & Hao, 2007; Y. Zhang, 2001). Any advantage in reading falls considerably or disappears (Hao & Bonstead-Bruns; Pong & Hao; Zhang). However Schwartz & Stiefel (2006), found significant advantages to being born in China in both English and mathematics in a study of New York City. Han's (2006) analyses of the Early Childhood Longitudinal Program-Kindergarten Cohort (ECLS-K) also support Schwartz and Stiefel's findings. In his national study of children in early education, he found that the advantage enjoyed by East Asian immigrant children in math and reading test scores remains and declines only slightly after controlling for parental and child characteristics, location, and parental well-being and educational practice in both reading and mathematics. Pong & Hao (2005) have similar findings. They found school and family variables explain almost none of the advantage in GPA of first-generation Asian immigrants over second and

third or later generation Asian immigrants as well as white third or later generation children.

The advent of longitudinal administrative databases that can track pupils and teachers over time has led to a greater emphasis on understanding the individual programs or factors that lead to changes in achievement D. Harris & Sass (2006). These approaches may take the form of growth rates in test scores or value-added models, where a lagged test score is added to the right hand side of the regression equation. Growth models by Y. Zhang (2001) suggest that first generation Asian immigrant children have faster mathematics growth rates than their third generation counterparts. These results are consistent with findings by Han (2006). Schwartz & Stiefel (2006) found that after controlling for the prior-year test score and a set of individual characteristics, on average, a child born in China, Hong Kong, or Taiwan scored between 0.077 and 0.159 standard deviations higher than a native-born child. These results are significant but considerably smaller in magnitude than the ordinary least squares models from the same study.

Theoretical Literature on East Asian Advantage

Several explanations have been put forth to explain the success of East Asian immigrant children. The media has tended to focus on the concept of the "model minority." A Time Magazine article reported, "…many do believe there is something in Asian culture that breeds success, perhaps Confucian ideals that stress family values and emphasize education" (Brand, 1987). The Model Minority concept and other theories are reviewed in this section.

Selection.

A straightforward explanation of the advantage foreign-born East Asian children have in education may be selection. If East Asian immigrant families and adults come from a self-selected group, it makes sense that their children may likewise have attributes that predispose them for either higher or lower levels of achievement. There remains a large flow of illegal immigration from the more rural areas of China, individuals who come to the United States in search of economic and educational opportunity, which they cannot find in their homeland (Ceasar, 2010). In addition, many East Asian American immigrant families are able to meet the financial requirements for family sponsorship. There are also large numbers of East Asian immigrants who take advantage of sponsorship from American educational institutions and corporations (American Immigration Council, 2010).

Data from the 2000 U.S. Census suggests that the East Asian families are not a random group. Median family income for foreign-born East Asian families was $54,484 versus only $50,046 for the average American family. The East Asian immigrant population also tends to be better educated than the overall population of the United States. Over 90 percent of East Asian foreign-born individuals 25 years or older had a high school degree or equivalent. This figure is almost 10 percent higher than the rate for all Americans. Over 42 percent of East Asian foreign-born individuals over the age of 25 had a Bachelor's degree or higher, compared to 30.7 percent of the entire American population. East Asian immigrant children also tend to live in two-parent households, with 83.7 percent of family households with married couples compared to only 80.4 percent of all families.

There are indications however, that challenges confront the population of East Asian immigrant Americans. According to the 2000 Census, only 69.9% of East Asian immigrants over the age of five speak only English or speak English, "very well." This percentage is much lower than the 90.2% rate for all Americans. In addition, East Asian families are more likely to live in poverty than American families as a whole. 11.5% of East Asian immigrant families are below the poverty line, compared to over 9% of all families. These contradictory results are consistent with the two streams of East Asian immigration, consisting of illegal immigrants from China, and more educated and affluent immigrants from the entire region.

East Asian Immigrants Children in New York City

The New York City data I am using also suggest East Asian immigrant children are different, even from other Asian children attending New York City public schools. These cross-tabs are presented in Table 4.1. These data are from the entire population of students.

Table 4.1: Average East Asian Immigrant Characteristics

Variable	East Asian immigrant child	Non-East Asian immigrant child	Asian child	All children
East Asian immigrant share in cohort	9.227	0.663	2.524	0.738
Repeater Student	0.008	0.019	0.005	0.018
Male	0.533	0.511	0.521	0.511
Special education student	0.038	0.161	0.062	0.160
Free or reduced-price lunch student	0.760	0.654	0.702	0.655
English language learner	0.364	0.104	0.145	0.106
Standardized ELA score	0.651	-0.004	0.466	0.000
Standardized mathematics score	0.839	-0.007	0.623	0.000
School-level measures				
Average Standardized ELA score	0.413	-0.004	0.269	-0.008
Average standardized mathematics score	0.404	-0.007	0.317	-0.005
School size	933.526	682.566	786.483	684.744
% of repeater students	6.112	10.361	0.932	1.849
% of special education students	11.781	16.000	12.675	15.963
% of free or reduced-price lunch students	67.484	65.504	64.441	65.521
% of English-language learners	13.429	10.611	11.807	10.635
% of immigrant students	26.561	15.772	22.579	15.866
% of East Asian immigrant students	8.591	0.800	2.737	0.868
% of minority students	78.670	86.127	80.332	86.062

Note: 1) Sample is from larger population of students. 2) ELA stands for English-language arts.

East Asian immigrant children are about half as likely to be enrolled in a special education program than Asian children as a whole and far less likely than their non-East Asian immigrant peers. Not surprisingly, they are also more likely to be English language learners than Asian children as a whole as well as the entire population of children. Despite this correlation with ELL status, their performance on standardized exams is exceptional. They score about two-thirds of a standard deviation above the mean in English-Language Arts and four-fifths of a standard deviation above the mean in mathematics. These scores surpass the average test scores of Asian children as a whole.

The New York City data suggests that there is a significant amount of sorting by East Asian immigrant children. The average East Asian immigrant student is in a cohort that is 9.2 percent East Asian, not including him or herself, compared to 2.5 percent for Asian children and less than one percent for all children. They tend to attend schools that are both big and high performing. The high share of immigrant students in East Asian immigrant schools also suggests their location in an immigrant enclave.

Teacher expectations.

Another explanation for high performance by East Asian children is stereotyping. Stereotyping should be distinguished from prejudice. Prejudice as defined by Macionis (2001) is "a rigid and irrational generalization about an entire category of people" (p. 357). Stereotypes are a form of prejudice. They are "an exaggerated description applied to every person in some category" (p. 359). Prejudice applied to an entire group of people, while stereotypes apply to specific members of that group.

Sociologist Sara Lightfoot (1978) suggests that teachers use stereotypes to classify students:

> Teachers, like all of us, use the dimensions of class, race, sex, ethnicity to bring order to their perceptions of the classroom environment. Rather than teachers gaining more in-depth and holistic understanding of the child, with the passage of time teachers' perceptions become increasingly stereotyped and children become hardened caricatures of an initially discriminatory vision. (p. 85-86)

Several experimental studies have suggested teachers do have stereotypes about certain groups of students. In these studies, teachers receive information about students in the form of written descriptions, photographs, videotapes, or real children recruited by the experimenters. Teachers are then asked to predict the ability or performance of each student

(R. F. Ferguson, 2003). In a meta-analysis of these experiments, Baron, Tom, & Cooper (1985) found that teachers had higher expectations for white students than for black students in nine of 16 studies. Five studies found statistically significant differences, all in the favor of white children. The authors concluded that the hypothesis of identical expectations for black and white students was clearly rejected.

There is qualitative research that suggests that teachers may view East Asian immigrant children more favorably than they may view other children, instead of viewing each child on his or her own merits. A study of children in public schools in Illinois reported a teacher declaring that,

> Students from the Eastern Hemisphere bring many skills with them. Their mathematics are excellent. They grasp it immediately . . . Oriental minds easily grasp concepts and rules of mathematics and apply them to new situations. It is a joy to work with them . . . They are patient, very obedient, and cautious with their work. Their work is neat and they listen attentively (Schneider & Lee, 1990, p. 371).

The low numbers of Asians in the typical American school also mean that teachers can readily identify good behavior and can reward it (A. L. Harris, Jamison, & Trujillo, 2008)

Stereotypes in and of themselves are not necessarily socially nefarious phenomena. They can be though if they result in self-fulfilling prophecies or perceptual biases. Ferguson (2003, p. 469) calls a self-fulfilling prophecy, "…one that makes a bias in a teacher's expectation regarding performance affect the student's performance." According to Smith, Jussim, VanNoy, Madon, & Palumbo (1998), perceptual biases occur when a perceiver's beliefs influence their evaluation of target behavior. Both of these behaviors could result in higher tests scores for East Asians.

"The Model Minority".

The Model Minority theory ascribes the educational success of Asian Americans, foreign and native born, to a specific philosophy or worldview that these individuals bring from Asia, and the way that philosophy interacts with American society. Schneider and Lee (1990) for example, proposed that the cultural advantages that East Asian children enjoy included: "…the East Asian cultural tradition which places a high value on education for self-improvement, self-esteem, and family honor, and (2) the determination by some East Asian families to overcome occupational discrimination by investing in education" (p. 368).

Scholars suggest these high child and parental expectations reflect a Confucian culture that is brought to the United States from East Asia. According to Bond & Hwang (1986), a person is defined by his or her relationship with others in Confucian culture. These relationships are structured hierarchically. Social order and harmony is maintained by each party honoring the requirements and responsibilities of his or her role. The hierarchical structure of Confucian society means the subordinate member (e.g. a child or student) is required to display loyalty and respect to the senior member (e.g. a parent or teacher), who in turn is required to govern, teach, and discipline (Chao, 1994). Survey research on twelfth graders in an ethnically diverse community in Northern California supports the model minority hypothesis. Fuligini, Tseng, & Lam (1999) found that Asian adolescents possessed stronger values and greater expectations regarding their duty to assist, respect, and support their families than classmates from European backgrounds.

These expectations may come from their parents. Consistent with Confucian philosophy, East Asian parents are known for consistently reminding their children that achievement is a duty and a family obligation rather than an individual goal. Failure brings

shame to the family (Zhou, 2005). For example, the son of a working-class Chinese immigrant in New York City told interviewers:

> And he came in and I was in bed and I was about to go to sleep and he goes, 'Look, my life is hard.' I said, "Yeah, I kind of realized that.' He said, 'I don't want you to grow up like me.' So it was the story of shape up in school, do well and be like your uncle…'Be like your uncle who is an engineer. He's a professional. He makes good money. He's well-respected in society.' And that's when it hit me. I was, 'Wow, okay.' And that's when it hit me. I was, 'Wow, okay.' And that's why I majored in engineering in college." (Kasinitz, Mollenkopf, Waters, & Holdaway, 2008, p. 149)

The hierarchical nature of Confucian philosophy may mean children from East Asian immigrant families tend to be less disruptive and more diligent than American children, behaviors that can result in higher test scores.

Community forces.

Social network theory holds that when it comes to the diffusion of ideas or beliefs within a social network, it is the number of weak ties in the social network and not the strength of those ties that is key (Granovetter, 1973). In other words, ideas are more likely to spread within a social network, like a community, if an individual develops many acquaintances rather than having a few close friends or family members. These weak ties are important in creating cohesion within a community.

These ties to social networks are forms of social capital. According to Portes (1998), "…social capital stands for the ability of actors to secure benefits by virtue of membership in social networks or other social structures" (p. 6). Membership in an ethnic community is a source of social capital that immigrants can draw on.[5] This social capital allows many East Asian immigrant children to overcome their socioeconomic status and

[5] This concept is similar to the theory of ethnic capital proposed by (Borjas, 1992, 1995).

perform well in school. The qualitative research suggests that the education institutions in Asian communities are more developed and focused on education than they are in other communities.

Both traditional ethnic enclaves like in New York City and San Francisco and relatively new ethnoburbs like in Monetery Park (for Chinese-Americans) and in Torrance (for Korean-Americans) in California have established sophisticated systems of ethnic supplementary education. Many Korean immigrant children for instance attend after-school or weekend Korean-language schools, religiously and secularly operated, which offer Korean-language courses and Korean themed extracurricular activities as Korean folk dance, calligraphy, and martial arts (Lew, 2007; Zhou & Kim, 2006).

These schools play an important role in transmitting social capital to immigrant children. The focus does not appear to be on maintain ethnic language but on maintaining ethnic identity. One Chinese school principal remarked:

> These kids are here because their parents sent them. They are usually not very motivated in learning Chinese per se, and we do not push them too hard. Language teaching is only part of our mission. An essential part of our mission is to enlighten these kids about their own cultural heritage, so that they show respect to their parents and feel proud of being Chinese. (Zhou & Kim, 2006, p. 19)

In Korean communities, the Korean church plays a similar role in transmitting social capital to its parishioners. Korean pastors often preach that traditional Korean values are more consistent with Christian theology than American ones are. Sermons that bring the attention of members to homeland also have this intended effect. These sermons may take the form of prayers for the reunification of the Korean peninsula, and recovery from floods that often ravage the region (Min, 1992).

The East Asian community reinforces pressure for academic achievement that parents already impart. Zhou (2005, p. 153) reported, "…in everyday conversation with children in the homes, streets, and restaurants in Chinatown, adults would frequently greet children in Chinese with 'How was school?' 'Did you behave in school today?' Did you do your homework?' Have you got your grades yet?' 'Are they any good?' or 'An A-minus? How come you didn't get an A-plus?'" In addition, young children who receive good grades and awards in school, win academic competitions, and gain admissions to ivy league schools are honored by civic organizations and in Chinese language newspapers and television programs.

Chinese and Korean language media in New York City provides extensive information about the best public schools. Almost all children of Chinese immigrants surveyed by Kasinitz, et al. (2008) reported their parents encouraged them to take the entrance exam for New York City's specialized high schools, even if they spoke little English or had a limited education.

One does not need to live in the community to tap its social capital; one only needs to be a member of the ethnic network in Zhou & Kim's (2006) framework. In fact, many East Asian families do not live in ethnic community but rather travel to it for after-school programs, family gatherings, and holiday celebrations (Zhou, 2005). Perhaps because of language difficulties and/or discrimination, working-class and middle class East Asian families inhabit the same spheres allowing the latter group to transmit information about how to navigate the public school system to the former group (Kasinitz, et al., 2008). These phenomena are consistent with research by Kroneberg (2008). He found that in communities characterized by high levels of self-employment, education, and aspirations

(like the East Asian immigrant community), students' math and reading test scores were considerably higher if the interviewed parent socialized mainly with co-ethnics. Community however, was not defined by geography, but by the average characteristics of specific ethnic groups in the metropolitan area.

The role of peers.

As with all children, Asian children, immigrant and native, tend to have friends who are from the same ethnicity (Joyner & Kao, 2000). As Asians as a whole tend to perform well academically, their ties to each other are likely to have positive effects on performance. A survey of secondary school students in a district in California found that Asian children were most likely to have friends who supported academic endeavors. Student interviews by Steinberg, Dornbusch, & Brown (1992) also found that,

> More often than not, Asian-American students belong to a peer group that encourages and rewards academic excellence. We have found, through student interviews, that social supports for help with academics—studying together, explaining difficult assignments, and so on—are quite pervasive among Asian-American students. Consistent with this, on our surveys, Asian-American youngsters reported the highest level of peer support for academic achievement. (p. 728)

This anecdote is consistent with national data on foreign-born Asians that suggested they are more likely to have school peers with high GPAs (Pong & Hao, 2005).

The relationships between Asian children also allow them to tap the social capital of their peers' families, which as suggested previously can be quite extensive. Asian peers and Asian peer families serve as a form of peer social capital. The support they provide each other can enhance the children's achievement of academic goals.

Tracking within schools exacerbates these peer influences. Children are most likely to form friendships with whom they share classes or activities (Lewis-Charp, Yu, & Friedlaender, 2004). Because of the strong achievement of Asian-American children, they tend to be tracked together with other high-ability students. The combination of intellectually stimulating classwork and better-behaved peers has been shown to result in a less disruptive environment (Schneider & Lee, 1990).

4.3. Hypotheses

By focusing on one particular immigrant group, this study has the ability to formulate and test a number of different hypotheses. I utilize the multiple variables and panel nature of the dataset to examine these hypotheses. In particular, I am interested in explicating the mechanisms involved in an East Asian immigrant composition effect. In addition, I examine interaction effects between East Asian immigrant composition and grade level and study sex-specific East Asian immigrant composition effects.

Mechanisms of East Asian Immigrant Composition Effects

Little (2005) defines social mechanisms as "concrete social processes in which a set of social conditions, constraints, or circumstances combine to bring about a given outcome." By investigating mechanisms, we are able to obtain insight into the exact causal pathway between East Asian immigrant composition and student achievement.

Camaraderie.

Crosnoe (2009a) found that low-income children who attended schools with affluent peers reported worse psychological outcomes including negative self-perceptions and feelings of social isolation than other low-income children.[6] He suggested that these pessimistic outcomes resulted from perceptions of stigmatization and isolation by students in the minority. Such instances of isolation have been documented for East Asian immigrant children. In an ethnography of an urban high school in California, Olsen (1997) observed minority Asian immigrant students who experienced discrimination and hostility from native-born students for difficulties with English and for excelling in school. A well-documented correlation between depressive symptoms and poor student performance (Alva & Reyes, 1999; Bhatia & Bhatia, 2007; Frojd et al., 2008; Hysenbegasi, Hass, & Rowland, 2005), suggests these feelings of isolation by minority students may result in poor academic performance.

On the other hand, a higher concentration of low-income students could improve the lot of these children by creating camaraderie and reducing the emotional strain felt by children in the minority. This is the theory behind many affirmative action policies in higher education (Gurin, 1999). If camaraderie were the mechanism behind East Asian immigrant composition effects, one can expect that as the share of East Asian immigrant children increased the achievement of all East Asian immigrant children on average would increase. There should be either no effect or a small negative effect on the achievement of their classmates, who become increasingly marginalized as East Asian share grows.

Good behavior.

[6] Much of this discussion is based on ideas developed by Conger (2011).

One potential mechanism behind an immigrant composition effect is good behavior. As discussed earlier in this chapter, the social science literature has suggested that the success of Asian Americans, particularly from East Asia, can be owed to a culture that promotes education and discipline. Both East Asian children and their parents place high expectations for their education. As a result, they tend to work harder, study harder, and are better behaved in school than other students. Indeed, Lorenzo, Pakiz, Reinherz, & Frost (1995) reported that Asian American students in a Northeastern school system, were significantly less likely than their peers to engage in acting out behaviors in school. These acting out behaviors included being disruptive in class, speaking out of turn, yelling or throwing objects, abuse substances or use foul language directed at their teachers or classmates.

East Asian immigrant students may hence enhance their classmates' educational experience by being better behaved, thereby creating an environment more conducive to learning. This situation has been described through observation by Schneider and Lee (1990). If the mechanism behind an immigrant peer effect is good behavior, an increase in the share of East Asian students should result in an increase in the achievement of all students, East Asian and non-East Asian. An environment where the teacher can relay his or her ideas and where students can hear the words of other students should be beneficial to all students.

Resource diversion.

A negative effect of East Asian immigrant composition on the achievement of both East Asian immigrant and non-East Asian immigrant children and children as a whole

could possibly be the result of a diversion of resources from the latter group to the former group. This state of affairs can occur if classroom learning displayed aspects of a common-pool resource. Cultural differences between East Asian immigrant children and the American school system for example, may mean that teachers must spend more time on this group of students to get them up to speed. East Asian immigrant children may also draw additional resources in the form of ELL classes.

Language difficulties.

A related mechanism to resource diversion is language difficulties. It goes without saying that many immigrants have problems with the English language. East Asian immigrant children are no different. The New York City data I am using confirm this hypothesis. An East Asian immigrant child is over three times more likely to be an English language learner than a non-East Asian immigrant child. A child with language difficulties may require a disproportionate amount of attention from a teacher, negatively affecting the educational experience of their peers. I test for the possibility that language problems are the mechanism behind an East Asian immigrant composition effect by controlling for the share of children who are English language learners in the cohort along with East Asian immigrant composition.

Interaction Effects

Interaction effects occur when a relationship between two or more variables depends on the value of one or more other variables (Brambor, Clark, & Golder, 2006). These effects are important as it may be that there are different effects for different

subgroups. This study tests a possible interaction between East Asian immigrant composition and grade level.

The Hoxby (2000b) study found evidence that the effect of having a more female peer group also depended on the grade of the students in questions. Specifically, she found that that the positive effect of a more female peer group on mathematics achievement was greater with each successive grade. The results for reading were mixed. Other studies like Burke & Sass (2008), Lefgren (2004), Levine (1983), and Whitmore (2005) have also suggested that peer effects may depend on grade level.

One would expect that the peers of older children to be particularly influential as children, particularly male children, become increasingly disruptive during their middle school years. Figlio (2007) suggests that during this period boys become more aware of their own sexuality and mix with a new set of classmates. On the other hand, elementary school children have more contact with each other. Most, if not all, of their classes are taken together. This situation may suggest stronger effects at the primary school level. The elementary school context where children are younger and have less experience with the English language may exacerbate the language problems immigrant children have. In this study, I estimate separate regressions for children in grades three through five and for children in grades six through eight.

Sex-Specific East Asian Immigrant Composition Effects

Son preference is an issue in East Asian cultures as well as a number of others, especially in rural areas in East Asia. Boys are preferred for a number of reasons. Sons are responsible for carrying out funeral rites for parents when they die. Sons carry on the

family name, and in rural areas, sons can help with farming and heavy duties (Chan, Yip, Ng, Ho, & Chan, 2002). This preference for boys has meant that girls in East Asia, particularly in China, have received relatively fewer opportunities for education than boys (W. Wang, 2005). While these institutions are less prevalent in the United States, there is evidence that they continue to exert influence in East Asian immigrant families (Abrevaya, 2005; Espiritu, 1999).

If it is true that East Asian immigrant girls have different educational opportunities from boys, they may also have different effects on their classmates. This suggests a sex-specific East Asian immigrant composition effect. As girls on average have inferior educational opportunities, I would expect them to drive East Asian immigrant composition effects.

Non-Linearities

The data I am using is not conducive to estimating non-linearities in East Asian immigrant composition effects because there is limited variation in the East Asian immigrant composition variable. Most schools in fact do not have any East Asian immigrant children in them. Nonetheless, I try to tease some information about potential non-linear composition effects by estimating separate regressions for grade-cohorts that are less than 14 percent East Asian immigrant and greater than or equal to 14 percent East Asian immigrant. The 14 percent point is roughly halfway between the minimum and maximum share of East Asian immigrant children in the cohort.

4.4. Variables

East Asian immigrant children were oversampled in this analysis. Only schools with any East Asian immigrant composition in the years of this dataset were sampled. 225 schools were sampled from this group of schools with East Asians and comprise the data in this analysis. Table 4.2 presents descriptive statistics for the variables used in this analysis.

Table 4.2: East Asian Descriptive Statistics

	Mean	Standard Deviation	Minimum	Maximum	N
East Asian immigrant share (%)	1.709	3.602	0.000	33.065	782,360
East Asian immigrant student	0.019	0.138	0.000	1.000	782,360
Repeater Student	0.009	0.095	0.000	1.000	782,360
Male	0.511	0.500	0.000	1.000	782,360
Special education student	0.131	0.338	0.000	1.000	782,360
Free or reduced-price lunch student	0.639	0.401	0.000	1.000	782,360
English language learner	0.115	0.319	0.000	1.000	782,360
Native American	0.004	0.062	0.000	1.000	782,360
Asian	0.217	0.412	0.000	1.000	782,360
Black	0.198	0.399	0.000	1.000	782,360
Hispanic	0.365	0.481	0.000	1.000	782,360
White	0.216	0.411	0.000	1.000	782,360
Standardized ELA score	-0.019	0.995	-5.930	4.071	725,322
Standardized mathematics score	-0.010	0.999	-6.110	4.370	772,834

Notes 1) Sample is from 225 schools with any East Asian immigrant composition. 2) ELA stands for English-language arts.

The test scores are the dependent variables in this study. These variables are standardized with mean zero and standard deviation one. The variable of interest for this study is the share of students in a grade in a school in a year that identify themselves as being born in Korea, China, or Japan. The average East Asian immigrant share in the sample is 1.7 percent. This variable ranges from 0 to 33.7 percent.[7] 1.9 percent of students in sample identify themselves as hailing from East Asia. Slightly over half of students are male in the sample. 13 percent of students are labeled as special education students, while

[7] East Asian immigrant share is calculated not including the individual observation.

11.5 percent are considered ELL. There is a high level of poverty in the sample as over 60 percent of students receive free or reduced price lunch. A plurality of students (37.7 percent) is Hispanic, with roughly equal shares of Asians, blacks, and whites.[8] There are 782,360 observations with data on the independent variables.

4.5. Results

Reduced-form

Table 4.3 presents the reduced form effect of East Asian immigrant composition on achievement in English-language arts. I argue as a matter of policy, this is the specification to consider. The policymaker cannot separate other variables that are correlated with East Asian immigrant composition. All standard errors are calculated using the Huber-White sandwich estimate of variance adjusted for clustering by school.

While column I only controls for individual fixed effects, the addition of school-by-grade fixed effects in column II and school-by-grade specific time trends in column III do not significantly change the results. In every specification, a higher share of East Asian immigrant children has a negative effect on student achievement. In column I, a 10 percentage point year-to-year increase in the share of East Asian immigrant children as a student moves with a grade-cohort is associated with a 0.03 standard deviation decrease in English-language arts achievement. In each specification, the estimate is significant at a 0.01 level.

[8] Because the sampling procedure oversampled East Asian immigrant children, Asian children are likewise oversampled.

Table 4.3: East Asian ELA Reduced Form Results

	I		II		III	
East Asian immigrant share	-0.003	**	-0.003	***	-0.003	***
	(0.001)		(0.001)		(0.001)	
Repeater student	0.177	***	0.181	***	0.180	***
	(0.016)		(0.016)		(0.016)	
East Asian immigrant share * repeater student	-0.031	***	-0.032	***	-0.032	***
	(0.005)		(0.005)		(0.005)	
English language learner	0.030	***	0.038	***	0.043	***
	(0.007)		(0.007)		(0.007)	
Free or reduced price lunch student	-0.017	***	-0.012	***	-0.011	***
	(0.003)		(0.003)		(0.003)	
Special education student	0.105	***	0.100	***	0.098	***
	(0.007)		(0.007)		(0.007)	
R-Squared	0.344		0.353		0.357	
School-by-grade fixed effects			X		X	
School-by-grade specific time trends					X	
Individual fixed effects	X		X		X	

Notes: 1) There are 725,322 observations. 2) All regressions control for grade-by-year fixed effects. 3) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 4) ***p<.01, ** p<.05, *p<.10.

Somewhat surprising are the signs on the coefficients of the English language learner and special education status variables. Both estimates are positive, suggesting that English language learners and special education students have higher ELA scores. Because of the individual fixed effects methodology, the interpretation is that ELL or special education children score better on ELA tests when they have ELL or special education status than if they do not. This surprising finding may have to do with exemptions from testing due to ELL or special education. It may also mean that classification in either of these categories means a child receives additional resources in the years they are ELL or special education than when they are not.

Repeater students also appear to have larger gains to achievement in ELA. The result suggests that there is an advantage to a student in repeating the same material as the year before. The interaction term between East Asian immigrant composition and repeater student is also negative and significant in each specification. This result may suggest that

East Asian immigrant composition has a more severe negative effect on ELA achievement for repeater students or it may be the effect of moving to a different cohort due to repeating a grade. R-Squared coefficients range from 0.344 in column I to 0.357 column III. In column III, the regression model explains 35.7 percent of the variation in ELA achievement.

Table 4.4: East Asian Mathematics Reduced Form Results

	I		II		III	
East Asian immigrant share	-0.007	***	-0.007	***	-0.006	***
	(0.001)		(0.001)		(0.001)	
Repeater student	0.218	***	0.224	***	0.224	***
	(0.016)		(0.016)		(0.016)	
East Asian immigrant share * repeater student	-0.033	***	-0.034	***	-0.036	***
	(0.004)		(0.004)		(0.004)	
English language learner	-0.108	***	-0.094	***	-0.083	***
	(0.008)		(0.007)		(0.007)	
Free or reduced price lunch student	-0.039	***	-0.031	***	-0.029	***
	(0.003)		(0.003)		(0.003)	
Special education student	0.124	***	0.118	***	0.116	***
	(0.007)		(0.007)		(0.007)	
R-Squared	0.417		0.434		0.443	
School-by-grade fixed effects			X		X	
School-by-grade specific time trends					X	
Individual fixed effects	X		X		X	

Notes: 1) There are 772,834 observations. 2) All regressions control for grade-by-year fixed effects. 3) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 4) ***p<.01, ** p<.05, *p<.10.

The ELA reduced form results are very similar to the mathematics results, which are presented in Table 4.4. As in the ELA results, East Asian immigrant composition is negatively associated with student achievement in mathematics. A 10 percentage point yearly increase in East Asian immigrant composition as a student progresses with a cohort is associated with a 0.07 to 0.08 standard deviation decrease in achievement in mathematics. In both ELA and mathematics, the results suggest East Asian immigrant composition has a harmful effect on student achievement.

While the coefficient on ELL status was previously positive in ELA, it is now negative in mathematics. This result may suggest that the test score gains in ELA for ELLs are not matched by test score gains in mathematics. As in ELA, there is a positive effect of repeating a grade, which can interpreted as a repeater student making larger gains to achievement in mathematics than a non-repeater student. The interaction term is negative and significant. This may be the result of cohort switches or a stronger negative effect of East Asian immigrant composition. R-squared coefficients in the mathematics regressions range from 0.417 in the individual fixed effects specification to 0.446 in the specification that controls for individual fixed effects, school-by-grade fixed effects, and school-by-grade specific time trends.

East Asians and Non-East Asians

Table 4.5 presents results for separate regressions for East Asian immigrant children and on non-East Asian immigrant children. These regressions are meant to test hypotheses about the mechanisms behind immigrant peer effects. The results are consistent with a resource diversion hypothesis as the subgroup regressions suggest East Asian immigrant children have negative effects on East Asian immigrant children as well as other children. A plausible explanation for the findings is that as the share of East Asian immigrant children grow, they consume a disproportionate amount of educational resources reducing the amount for all students. Based on these results, there is no evidence to support that camaraderie or good behavior are the mechanisms behind an East Asian immigrant composition effect. These mechanisms would be supported by positive East Asian composition effects.

Table 4.5: East Asian Students and Other Students

	ELA				Math			
	Just East Asians		Other Children		Just East Asians		Other Children	
East Asian immigrant share	-0.001		-0.003	***	-0.011	***	-0.005	***
	(0.002)		(0.001)		(0.003)		(0.001)	
Repeater student	0.218		0.177	***	0.173	*	0.107	***
	(0.156)		(0.015)		(0.100)		(0.016)	
East Asian immigrant share * repeater student	-0.020		-0.034	***	-0.011		-0.019	***
	(0.015)		(0.005)		(0.012)		(0.004)	
English language learner	0.055	**	0.043	***	-0.157	***	-0.045	***
	(0.027)		(0.007)		(0.025)		(0.011)	
Free or reduced price lunch student	0.009		-0.012	***	0.019		-0.020	***
	(0.020)		(0.003)		(0.016)		(0.004)	
Special education student	-0.017		0.099	***	0.078		0.073	***
	(0.082)		(0.007)		(0.063)		(0.009)	
R-Squared	0.435		0.357		0.513		0.416	
N	10,341		714,981		15,019		500,363	

Notes: 1) All regressions control for individual, grade-by-year and school-by-grade fixed effects and school-by-grade-specific time trends. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) ***p<.01, ** p<.05, *p<.10.

The effect of East Asian immigrant composition in ELA is stronger for other children than for East Asian children. Controlling for individual and school-by-grade fixed effects and school-by-grade trends, the results suggest that a 10-percentage point increase in East Asian immigrants is associated with a 0.01 standard deviation decrease in ELA test score for East Asian immigrant children and a 0.03 standard deviation decrease for other children. In mathematics, the effect sizes are somewhat higher. The coefficient on East Asian immigrant share for East Asians is -0.011 and the coefficient for other children is -.005.

ELL

Table 4.6 looks at the role ELL status plays in East Asian immigrant composition effects. The coefficients of East Asian immigrant composition are not appreciably different from the results in Tables 4.3 and 4.4. The results suggest that there is little relationship

between East Asian immigrant composition and ELL. ELL share is actually positively associated with achievement in ELA, though the coefficient is very small. This finding is not consistent with the resource diversion hypothesis, as one would expect that one of the main reasons an immigrant child diverts resources is due to ELL.

Table 4.6: East Asian Regressions Controlling for ELL and Mobility Share

	ELA		Math	
East Asian immigrant share	-0.004	***	-0.007	***
	(0.001)		(0.001)	
Repeater student	0.179	***	0.224	***
	(0.015)		(0.016)	
East Asian immigrant share * repeater student	-0.032	***	-0.036	***
	(0.005)		(0.004)	
English language learner	0.041	***	-0.083	***
	(0.007)		(0.007)	
Free or reduced price lunch student	-0.012	***	-0.029	***
	(0.003)		(0.003)	
Special education student	0.097	***	0.115	***
	(0.007)		(0.007)	
ELL share	0.001	***	0.000	
	(0.000)		(0.001)	
R-Squared	0.357		0.443	
N	725,322		772,834	

Notes: 1) All regressions control for individual, grade-by-year and school-by-grade fixed effects and school-by-grade-specific time trends. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) ***p<.01, ** p<.05, *p<.10. 4) R-squared coefficient is calculated based on a individual demeaned model and dummy variables for grade-by-year, school-by-grade fixed effects and school-by-grade specific time trends.

The positive coefficient on ELL share in ELA in Table 4.6 is somewhat perplexing. One possibility may be that with a greater concentration of ELL students, teachers are better able to tailor their curriculum and instruction to serve the needs of children with language difficulties. It may also be that the additional resources that come with being ELL overcome any negative effect ELL children may have.

Other Composition Variables

It may be that the share of East Asian immigrant children in a cohort is correlated with other variables that are the true cause of the negative coefficient on East Asian immigrant share. This is a form of omitted variable bias. Table 4.7 presents results from two additional specifications that include other composition variables. Specification I adds ethnicity composition variables as well as English language learner, free or reduced price lunch, and special education composition. Specification II in this table is what I call the full model. This specification includes control variables for Western and Northern Europe, Eastern and Southern Europe, Former USSR, Northern and Western Asia, Sub-Saharan Africa, South Asia, Southeast Asia, Australia and Oceania, Canada, Dominican, Caribbean, and other Latin America immigrant shares.

Table 4.7: East Asian Regressions with Other Composition Variables

	ELA				Math			
	I		II		I		II	
East Asian immigrant share	-0.004	***	0.000		-0.006	***	0.005	***
	(0.001)		(0.001)		(0.001)		(0.001)	
Repeater student	0.174	***	0.153	***	0.215	***	0.177	***
	(0.015)		(0.014)		(0.015)		(0.015)	
East Asian immigrant share * repeater student	-0.032	***	-0.031	***	-0.034	***	-0.033	***
	(0.005)		(0.005)		(0.004)		(0.004)	
English language learner	0.044	***	0.053	***	-0.076	***	-0.055	***
	(0.007)		(0.007)		(0.007)		(0.007)	
Free or reduced price lunch student	-0.003		-0.002		-0.004	***	-0.001	
	(0.002)		(0.002)		(0.002)		(0.002)	
Special education student	0.094	***	0.089	***	0.108	***	0.096	***
	(0.007)		(0.007)		(0.007)		(0.007)	
Asian share	0.001	***	-0.000		0.001	***	-0.001	***
	(0.000)		(0.000)		(0.000)		(0.000)	
Black share	0.001	***	0.001	**	0.003	***	0.001	***
	(0.000)		(0.000)		(0.000)		(0.000)	
Hispanic share	-0.000		0.000		0.001	**	0.001	***
	(0.000)		(0.000)		(0.000)		(0.000)	
Native American share	-0.001		-0.004		0.004		-0.003	
	(0.044)		(0.004)		(0.005)		(0.005)	
English language learner share	0.044	***	-0.001		0.002	***	-0.006	***
	(0.007)		(0.001)		(0.000)		(0.001)	
Free or reduced price lunch share	-0.003		-0.001	***	-0.003	***	-0.002	
	(0.002)		(0.000)		(0.000)		(0.000)	
Special education share	0.094	***	0.003	***	-0.004	***	0.002	
	(0.007)		(0.001)		(0.001)		(0.005)	
Other region variables	No		Yes		No		Yes	
R-Squared	0.358		0.359		0.445		0.452	
N	725,322		725,322		772,834		772,834	

Notes: 1) All regressions control for individual, grade-by-year and school-by-grade fixed effects and school-by-grade-specific time trends. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) ***p<.01, ** p<.05, *p<.10. 4) R-squared coefficient is calculated based on a individual demeaned model and dummy variables for grade-by-year, school-by-grade fixed effects and school-by-grade specific time trends.

The results presented in Table 4.7 are very intriguing. East Asian immigrant composition remains negative and significant in both ELA and mathematics when adding the first set of composition variables, which consist of the ethnic composition variables, and ELL, free or reduced price lunch and special education composition variables. This result suggests that none of these characteristics is the main factor behind the East Asian immigrant composition effect observed.

On the other hand, there are large changes to the East Asian immigrant share coefficients when the additional region composition variables are added. In ELA, the coefficient on East Asian immigrant share is virtually zero. In mathematics, the coefficient is actually positive and significant at the 0.01 level. Each 10-percentage point increase in East Asian immigrant share in this specification is associated with a 0.005 standard deviation increase in student achievement in mathematics.

These results suggest that cohorts with high shares of East Asian immigrants also have high shares of other types of immigrants. It is these other immigrants that cause the negative coefficient on East Asian immigrant share in Table 4.3. The coefficients on the East Asian variables in this table are more in line with the research on East Asian immigrant achievement presented earlier in this chapter. The empirical literature discussed earlier in this chapter suggests that East Asian immigrant children perform well in mathematics even after controlling for differences in socioeconomic status (Hao & Bonstead-Bruns, 1998; Kao & Tienda, 1995; Pong & Hao, 2007; Y. Zhang, 2001), while the advantage in reading virtually disappears (Hao & Bonstead-Bruns; Pong & Hao; Zhang).

These additional results are consistent with the good behavior mechanism. Culture appears to play an important role. Given a lack of facility with the English language, one would expect East Asian immigrants would have negative effects on their schoolmates in ELA. But because of motivation or good behavior, they are able to overcome that deficit to have a net zero effect. On the other hand, in mathematics, where the importance of English to comprehending the subject, or language load, is lower, they actually have positive effects

on their schoolmates. It may be that East Asian immigrant children are better behaved and create and environment that is more conducive to learning for all children.

However, as I discussed previously, as a matter of policy, I do not think it is practical to separate the effect of East Asian immigrant composition from other correlated effects. Neverthless, the positive coefficient in mathematics is an interesting theoretical result. These results also help explain some of the conflicting results presented earlier in this section. They suggest that the reduced form negative effect and subgroup effects are driven by the presence of immigrant children in general, while the East Asian effect when separated from other correlated effects is either zero or positive depending on the exam.

Threats to Internal Validity

While the panel data methods I used in the previous analyses provide powerful protection against selection, there are still several threats to the internal validity of this study. This section reviews some potential threats and tests I use to support my analysis.

Cohort selection.

The methodology of this study relies on the assumption that while students may select into schools based on school characteristics, they do not select into grade-cohorts based on deviations of cohort specific characteristics from school averages. However, there is reason to believe this assumption may not hold. One can imagine a situation where for whatever reason one year saw the entry of many new East Asian immigrant children. The literature reviewed earlier suggested that East Asian immigrant children are viewed positively as classmates and students. This suggests that better students would select into

cohorts with high shares of East Asian immigrant children. On the other hand, ethnic sensitivities may cause certain students to select out of cohorts with high share of East Asian immigrant children. To test both possibilities, I present the results of a balancing test.

This balancing test regresses the average year to year change in East Asian immigrant composition for an individual on the set of observable statistics the first time a student is observed in a school, controlling for school-by-grade and grade-by-year fixed effects, a dummy variable for East Asian immigrant status, and whether the student repeats a grade. The school-by-grade fixed effects as in the main set of results prevent against students who switch schools from driving the results. The grade-by-year fixed effects control for differences between grade-years in curriculum and other matters. Likewise, the control for whether a student repeats a grade prevents a student who switches cohorts because he or she repeats a grade from influencing the estimation of East Asian immigrant composition effects. The control for East Asian immigrant status is necessary because a student who is East Asian is presumably more likely to be in a cohort with other East Asians, creating a correlation between East Asian immigrant status and East Asian composition. The control removes this potential source of bias.

The intuition behind this test is that we should not see students selecting based on observable characteristics into schools and cohorts according to the year-to-year variation in East Asian immigrant cohort composition. The degree of selection on observables is a guide to the degree of selection on observables (Altonji, Elder, & Tabor, 2005; Bifulco, et al., 2008). Based on chance, I can expect that one of the coefficients in the regression is significant at a 0.10 level, and at most one coefficient is significant at a 0.05 level. Any more significant coefficients would raise doubts about my identifying assumption because

it would suggest some type of systematic selection of students. Additional support for my identifying assumption would take the form of an F-test for the joint significance of the ten observable characteristics presented in Table 4.8.

Because of the number of observations used in the regressions however, an additional modification of this balancing test is necessary. Conducting this balancing test with the over 700,000 observations would result in numerous "false positive" results. These false positives would be caused by very small standard errors due to the large sample size. Instead, I aggregate the data by cluster and run the regression on the aggregated data. A cluster is a group of correlated observations (Williams, 2000). Five variables define a cluster in this analysis: the school a student is first observed in, the grade the student is first observed in, the year the student is first observed in, the number of years a student is observed in a school, and whether the student repeats a grade during his or her time in the school. All the individuals in a cluster experience the same average change in East Asian immigrant share. Aggregating the data sharply reduces the number observations to 10,936 cases by taking the average of each independent variable within the cluster, making the likelihood of Type II errors less likely. The results of this balancing test are presented in Table 4.8.

Table 4.8: East Asian Balancing Test

English language learner	0.030	
	(0.056)	
Free or reduced price lunch student	-0.034	
	(0.048)	
Special education student	0.003	
	(0.050)	
Male	0.021	
	(0.046)	
Asian	0.075	
	(0.095)	
Black	0.157	*
	(0.090)	
Hispanic	-0.005	
	(0.084)	
Native American	-0.076	
	(0.232)	
Standardized ELA score	0.019	
	(0.023)	
Standardized math score	0.007	
	(0.022)	
R-Squared	0.168	
N	10,836	

Notes: 1) Regression controls for school-by-grade fixed effects. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) Regression controls for East Asian immigrant status and whether the student ever repeated a grade. 4) ***p<.01, ** p<.05, *p<.10.

Only one of the variables in the balancing test (Black) is significant in this regression, and only at the 0.10 level. This single result may be the result of chance. While this does not in any way rule out the presence of cohort selection, it at least provides some evidence that suggests that cohort selection is not behind the results. This balancing test is admittedly ad hoc but is necessitated by the lack of time-variant variables in this study.

Attrition.

Students who are in the New York City public school system the longest are responsible for most of the variation in this study as the empirical model uses within-

student, within-cohort variation in achievement and East Asian immigrant composition to produce estimates of East Asian immigrant composition effects. This form of attrition is analogous to attrition in randomized experiments. If children who have multiple observations are systematically different from the average student, there may be bias as a result. For example, these children may come from families with two-parent households and have relatively stable home lives, which is why they do not leave the school system often. This threat to internal validity is different from selection bias as it can result even with randomized assignment. Treatment and comparison groups become different after they are selected. I tested this possibility by comparing regressions results with students with three or fewer data points and regression results with four to six data points. The results in Table 4.9 do not suggest large differences between the two groups.

Table 4.9: East Asian Tests for Attrition

	ELA				Math			
	<=3		>3		<=3		>3	
East Asian immigrant share	-0.004	**	-0.002	**	-0.006	***	-0.005	***
	(0.002)		(0.001)		(0.002)		(0.001)	
Repeater student	0.257	***	0.154	***	0.304	***	0.182	***
	(0.021)		(0.017)		(0.020)		(0.016)	
East Asian immigrant share * repeater student	-0.038	***	-0.025	***	-0.033	***	-0.035	***
	(0.006)		(0.006)		(0.005)		(0.005)	
English language learner	0.053	***	0.045	***	-0.035	***	-0.084	***
	(0.008)		(0.012)		(0.009)		(0.009)	
Free or reduced price lunch student	-0.005		-0.005		-0.021	***	-0.002	
	(0.003)		(0.004)		(0.003)		(0.003)	
Special education student	0.081	***	0.090	***	0.107	***	0.085	***
	(0.008)		(0.010)		(0.009)		(0.009)	
R-Squared	0.349		0.396		0.423		0.527	
N	525,787		199,535		561,401		211,433	

Notes: 1) All regressions control for individual, grade-by-year and school-by-grade fixed effects and school-by-grade-specific time trends. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) ***p<.01, ** p<.05, *p<.10.

Grade Level Interactions

Table 4.10 presents the results of regressions that divide the dataset into separate samples by grade level, one set for grades 3-5 and one set for 6-8. There do appear to be differences by grade level. Children in the lower grade levels appear to be affected more negatively by East Asian immigrant composition than children in upper grade levels. This finding holds for both English-language arts and for mathematics.

Table 4.10: East Asian Grade Level Interactions

	ELA				Math			
	Grades 3-5		Grades 6-8		Grades 3-5		Grades 6-8	
East Asian immigrant share	-0.005	**	-0.002	*	-0.008	***	-0.005	***
	(0.002)		(0.001)		(0.002)		(0.001)	
Repeater student	0.334	***	0.097	***	0.423	***	0.107	***
	(0.024)		(0.019)		(0.025)		(0.016)	
East Asian immigrant share * repeater student	-0.032	***	-0.020	***	-0.033	***	-0.019	***
	(0.010)		(0.005)		(0.010)		(0.004)	
English language learner	0.052	***	0.037	***	-0.118	***	-0.045	***
	(0.012)		(0.008)		(0.009)		(0.011)	
Free or reduced price lunch student	-0.032	***	-0.002		-0.049	***	-0.020	***
	(0.005)		(0.003)		(0.005)		(0.004)	
Special education student	0.128	***	0.068	***	0.154	***	0.073	***
	(0.011)		(0.008)		(0.010)		(0.009)	
R-Squared	0.318		0.380		0.469		0.416	
N	250,948		474,374		272,471		500,363	

Notes: 1) All regressions control for individual, grade-by-year and school-by-grade fixed effects and school-by-grade-specific time trends. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) ***p<.01, ** p<.05, *p<.10.

In ELA, a 10 percentage point increase in East Asian immigrant composition is associated with a 0.05 standard deviation decrease in test score in elementary school. This result is significant at the 0.01 level. In grades 6-8 however, the effect is 60 percent smaller. The results are similar for mathematics. In math, a 10 percentage point increase in East Asian immigrant composition is associated with a decline in achievement of 0.08 standard deviations in grades 3-5. The magnitude is smaller in the later grades. Children spend more time with each other in elementary school. East Asian immigrant children may hence have a more disruptive effect there.

Sex-Specific East Asian Effects

Table 4.11 presents results of analyses that examine sex-specific East Asian composition effects. These were conducted to examine if East Asian immigrant composition effects differed by gender.

Table 4.11: Sex-Specific East Asian Immigrant Composition Effects

	ELA		Math	
Male East Asian immigrant share	-0.008	***	-0.013	***
	(0.002)		(0.002)	
Female East Asian immigrant share	0.002		-0.002	
	(0.002)		(0.003)	
Repeater student	0.204	***	0.252	***
	(0.015)		(0.017)	
Male East Asian immigrant share * repeater student	0.001		0.007	
	(0.018)		(0.017)	
Female East Asian immigrant share * repeater student	-0.020		-0.006	
	(0.018)		(0.015)	
English language learner	0.043	***	-0.083	***
	(0.007)		(0.007)	
Free or reduced price lunch student	-0.011	***	-0.029	***
	(0.003)		(0.003)	
Special education student	0.098	***	0.116	***
	(0.007)		(0.007)	
R-Squared	0.356		0.443	
N	725,322		772,834	

Notes: 1) All regressions control for individual, grade-by-year and school-by-grade fixed effects and school-by-grade-specific time trends. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) ***p<.01, ** p<.05, *p<.10.

Contrary to my expectations, East Asian immigrant composition effects operate through boys. This finding may be related to the literature on gender composition, which suggests female composition has positive effects on achievement.

Non-Linearities

Table 4.12: Non-Linear East Asian Immigrant Composition Effects

	ELA				Math			
	<14%		>=14%		<14%		>=14%	
East Asian immigrant share	-0.003	***	-0.008	***	-0.005	***	-0.015	***
	(0.001)		(0.003)		(0.001)		(0.005)	
Repeater student	0.177	***	-0.050		0.222	***	-0.240	
	(0.016)		(0.248)		(0.016)		(0.315)	
East Asian immigrant share * repeater student	-0.036	***	0.004		-0.038	***	0.008	
	(0.005)		(0.016)		(0.004)		(0.017)	
English language learner	0.041	***	0.042		-0.083	***	-0.049	
	(0.007)		(0.084)		(0.007)		(0.098)	
Free or reduced price lunch student	-0.013	***	0.025		-0.029	***	-0.041	
	(0.003)		(0.055)		(0.003)		(0.041)	
Special education student	0.100	***	0.107		0.115	***	0.201	**
	(0.007)		(0.129)		(0.007)		(0.091)	
R-Squared	0.350		0.477		0.442		0.492	
N	718,620		6,702		764,382		8,452	

Notes: 1) All regressions control for individual, grade-by-year and school-by-grade fixed effects and school-by-grade-specific time trends. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) ***p<.01, ** p<.05, *p<.10.

Table 4.12 presents the non-linear estimates of East Asian immigrant composition effects. The results suggest the negative effect of East Asian immigrant composition is stronger at higher levels of East Asian immigrant composition. The effect of East Asian immigrant composition in cohorts with greater than or equal to 14 percent East Asian immigrant composition is 2.7 times the effect seen in cohorts with less than 14 percent East Asian immigrant composition in ELA. In mathematics, the effect in high East Asian immigrant composition cohorts is roughly three times that in low East Asian immigrant composition cohorts. It may be that in these settings, it is easier for East Asian immigrant children to form self-contained groups to the detriment of their education and that of their schoolmates.

4.6. Summary and Discussion

This chapter looked at the impact of East Asian immigrant composition on student achievement in New York City. The literature on East Asian immigrant children is a positive one, demonstrating that East Asian immigrant children appear to be performing well in American schools. This analysis however, suggests that if East Asian immigrant children enjoy academic advantages it is not due to the peers they keep. Rather, selection, a Confucian worldview and community forces are more likely explanations.

The results suggest a negative relationship between East Asian immigrant composition and student achievement. Subgroup analyses suggest that East Asian immigrant composition has a negative effect for both East Asian immigrant children, other children, and children as a whole. These results are consistent with a theory of resource diversion. This theory predicts that as the share of immigrant children grew, they would consume a disproportionate share of resources, reducing the amount available for all children, including other East Asian children. Not consistent with this theory however is the finding on ELL. One of the most obvious reasons these children may have this effect is due to their problems with the English language. However, the regression results suggest that ELL does not play much of a role in explaining the East Asian immigrant composition effect.

These contradictory results are partially explained by omitted variable bias. Regressions that control for other regional composition variables suggest a high degree of correlation between East Asian immigrant composition and other forms of immigrant composition. When these controls are added, the coefficient on East Asian immigrant composition becomes zero in ELA, and positive and significant in mathematics. This

additional set of results suggests that in mathematics, which does not require the same level of command of English as English does, East Asian immigrants have a positive effect on their schoolmates. This may be because they are better behaved or through their hard work serve as a model for their peers.

It is not clear how interesting these results are for policy. It can be argued that it is not possible for a policymaker to design policies for East Asian immigrant children separate from things that are correlated with their presence. I further examine the role of culture in immigrant composition effects by examining another group of immigrant children: Dominicans in the next chapter.

Chapter 5

DOMINICAN IMMIGRANT COMPOSITION EFFECTS

Dominican children are the largest single immigrant group in New York City's public schools, and Dominicans as a whole are the largest immigrant group in New York. An examination of this group provides a comparison with the East Asian children discussed in the previous chapter. Together, the analyses of East Asian and Dominican immigrant composition effects should provide a fuller picture of the effect immigrant children have on their classmates.

This chapter begins with some background on Dominican immigrants in the United States and in New York City. It finds that Dominican immigrant children face many challenges including high rates of free or reduced price lunch, ELL, and low performance on standardized exams. Section three asks and responds to the question of what makes Dominican immigrants different? It reviews the evidence on Dominican immigrant achievement and provides some explanations for their school performance. The theories reviewed in this section are community forces, racial discrimination, teacher expectations, oppositional identities and transnational identities. Section four uses the literature review developed in the previous section to formulate hypotheses about Dominican immigrant composition effects. Mechanisms I test are many of the same ones in the previous chapter including camaraderie and resource diversion. I also examine interactions with grade level and sex-specific Dominican immigrant composition effects. The variables used in this set of analyses and descriptive statistics are presented in section five.

Section six presents the results as well as tests for the presence of threats to internal validity. The results are remarkable in their similarity to the results in the East Asian chapter. The results suggest that as the share of Dominican immigrant children in a cohort increases, achievement in English-language arts and mathematics decreases. This finding applies to both Dominican immigrants as well as other children, which is consistent with a resource diversion hypothesis. This negative effect of composition does not seem to be driven by ELL, which is not consistent with a resource diversion hypothesis. These results should be taken with some caution as tests of internal validity are ambiguous. While coefficients are smaller in magnitude when adding other composition variables, they remain negative, and significant in mathematics. Section seven summarizes the findings of this chapter and concludes.

5.2. Dominicans in the United States

The 2000 United States Census found that there are 1,041,910 Dominicans in the United States, making Dominicans the fourth largest Latino group in the United States. 53.2 percent of Dominicans reside in New York City, where they are New York's largest immigrant group (Lobo & Salvo, 2004). One out of every three Dominicans in the City lives in Manhattan. Projections suggest that by 2010, Dominicans will overtake Puerto Ricans as New York's largest Latino group (Hernández & Rivera-Batiz, 2003).

Among the characteristics that make Dominicans unique is their socioeconomic status. The mean annual per-capita household income of the Dominican population was $11,065 in 1999, which is about half the average per-capita household income of the average American household. This figure is also significantly lower than the per-capita

income of the African-American population and even slightly lower than the average Latino household. While East Asian immigrants are among the most educated of all immigrants, Dominicans are among the least. Almost half of Dominican-Americans 25 years or older had not completed high school, and only 10.6 percent had completed college, according to the U.S. Census (Hernández & Rivera-Batiz, 2003).

Dominicans in New York City

Table 5.1: Average Dominican Immigrant Characteristics

Variable	Dominican immigrant child	Non-Dominican immigrant child	Hispanic child	All children
Dominican immigrant share in cohort	8.163	1.401	2.591	0.738
Repeater Student	0.021	0.018	0.021	0.018
Male	0.507	0.512	0.511	0.511
Special education student	0.110	0.160	0.182	0.160
Free or reduced-price lunch student	0.798	0.653	0.688	0.655
English language learner	0.478	0.101	0.189	0.106
Standardized ELA score	-0.130	0.002	-0.183	0.000
Standardized mathematics score	-0.220	0.003	-0.166	0.000
School-level measures				
Average Standardized ELA score	-0.133	0.002	-0.122	-0.008
Average standardized mathematics score	-0.190	0.003	-0.102	-0.005
School size	890.901	681.581	690.697	684.744
% of repeater students	1.921	1.848	2.071	1.849
% of special education students	14.726	15.982	16.432	15.963
% of free or reduced-price lunch students	76.523	65.352	68.003	65.521
% of English-language learners	17.858	10.524	14.836	10.635
% of immigrant students	19.344	15.813	16.370	15.866
% of Dominican immigrant students	7.657	1.417	2.605	0.868
% of minority students	96.614	85.900	91.627	86.062

Note: 1) Sample is from larger population of students. 2) ELA stands for English-language arts.

Approximately four-fifths of Dominican immigrant children receive free or reduced price lunch in Table 5.1 based on the entire population of students from New York City.

This rate is 14.3 percentage points higher than the system-wide average and over 10 percentage points higher than the Hispanic rate. Almost half of Dominican immigrant children are English language learners, which is roughly five times the rate of all children in New York City and also greater than the rate of East Asian immigrant children. They score over a tenth of a standard deviation below the mean in English-Language Arts and over a fifth of a standard deviation below the mean in mathematics. Dominican immigrant children perform better on average than Hispanic children in ELA and perform worse in mathematics.

The data also suggest the presence of sorting by Dominican immigrant children. Like East Asian immigrant children, Dominican immigrants attend large schools, relative to other Hispanics and children as a whole. Their schools are also overwhelming economically disadvantaged and have high shares of ELLs, minorities, and other Dominican immigrant children. These data strongly suggest the Dominican immigrant community is one that faces multiple challenges.

5.3. Why Are Dominican Immigrant Children Different?

Compared to the literature on East Asian immigrant achievement, the research on Dominican achievement is relatively scant. The research has instead focused on the achievement of Mexican children or Latino children as a whole. While the largest immigrant group in New York City is Dominicans, Mexicans and Puerto Ricans nationally far outnumber Dominicans. Nevertheless, a few studies focus on the achievement of Dominicans. Not surprisingly, two of these studies are set in New York City.

Dominican Achievement

Among all of the immigrant groups in New York City public schools examined by Conger, et al. (2003), Dominican immigrant children fared the worst on standardized exams. Dominican children scored 0.358 standard deviations below the mean in reading and 0.438 standard deviations below the mean in mathematics. The performance of Dominican immigrant children was poor even when compared to other Hispanic and Latino children.

Controlling for free or reduced-price eligibility, gender, age, ethnicity/race, English proficiency, special education status, teacher qualification, the previous year test score, and school fixed effects, Schwartz & Stiefel (2006) found that children born in the Dominican Republic score approximately a tenth of a standard deviation below native-born children. These results were significant at the 0.01 level. This study also used data from New York City. It suggests that poverty and limited English proficiency explain much, but not all, of the poor performance of foreign-born children from the Dominican Republic.

Consistent with these findings is a study by Han (2006). Han found that children from the Dominican Republic on average scored approximately a half a standard deviation below the national average in reading and roughly 0.70 standard deviations below the national average in mathematics. Their achievement is roughly in line with the achievement of second-generation children from the Dominican Republic but significantly and substantially below that of third and later generation Hispanic children.

Han's (2006) study suggests that observable characteristics explain about half of the disadvantage enjoyed by first-generation Dominican children. Child and parental characteristics, particularly as it relates to language, education, socioeconomic status, and

location of residency explain almost half the gap between the achievement of first-generation Dominican children and third or later generation non-Hispanic white children and between Dominican children and third or later generation Hispanic children.

Han (2006) also found that children born in the Dominican Republic do not see their test scores grow as quickly as third or later generation white and Hispanic children, as well as second-generation Dominican children. In reading, observable characteristics explained about 18.2 percent of the growth rate in achievement of Dominican immigrant children. However, they explained about 36.8 percent of the growth rate in mathematics test scores.

Overall, the literature suggests that on average, Dominican immigrant children come from low-SES families with low levels of proficiency in English. In addition, Dominican immigrant families are also on average the largest, and most likely to headed by a single parent of almost all immigrant groups in New York City (Kasinitz, et al., 2008). These characteristics explain most of the relatively poor performance of Dominican children. Nevertheless, socioeconomics do not appear to explain all of the variation in Dominican performance, which may suggest that something unobservable is also at work.

Theoretical Literature on Dominican Performance

Socioeconomics are a powerful reason for Dominican performance, but as suggested above is probably not the sole reason behind it. Rather there are likely other contributing factors. In this section, I review some theories that help explain the poor performance of Dominican immigrant children in the United States. These theories are not mutually exclusive however, and it is likely that some combination of factors is at work.

Community forces.

As I discussed in the previous chapter, researchers have postulated a relationship between ethnic communities and the relative strong performance of East Asian immigrant children. Community forces may also affect the performance of Dominican immigrant children, but in a more negative manner.

In New York City, the majority of Dominican immigrants live in two boroughs, Manhattan and the Bronx. In Manhattan, they are concentrated in two communities, Washington Heights and Inwood. The move to the Bronx is a more recent one and is the result of decreasing affordability of housing in Manhattan and increasing safety in the Bronx (Miller, Salandy, Schain, & Tejada, 2007). The number of foreign-born Dominicans in Washington Heights has fallen sharply. In 1990, 89 percent of Dominicans in Washington Heights and Inwood between 15 and 44 were born in the Dominican Republic. In 2005, this figure fell to 67 percent (Fernandez, 2007).

Despite growing affluence, Washington Heights and the Bronx remain a center of drug and gang activity. In 2009, the New York Police Department arrested 35 members of the Trinitarios gang in Washington Heights and the Bronx. The gang was charged with drug trafficking and violence after a two-year investigation by city and federal investigators (Fleischer, 2009). The economic downturn has also resulted in a spike in gang recruiting and violence in the Washington Heights neighborhood (Rincon, 2011).

The children in Washington Heights are not immune from these problems. A boy from Washington Heights reported seeing: “A lot of gangsters…they curse a lot and throw bottles and drink alcohol…they always in a group and by my building and I always see

them fighting…" A female teenager from Washington Heights added: "They like to throw glass bottles…they like to shoot…then one man was drunk when I went to the store and the other man hit him with a glass bottle...they got drugs 'cause they like to fight…they always pick at arguments…they be doing illegal things" (Schaefer-McDaniel, 2007, p. 426).

The neighborhoods with high Dominican concentrations also have some of the city's poorest performing schools. District 6, which comprises most of Washington Heights and Inwood, had a K-8 English passing rate of 33 percent and a K-8 mathematics passing rate of 41 percent in 2010, considerably lower than the 47 percent and 54 percent passing rates citywide. Children perform even worse in District 7, which is comprised entirely of the South Bronx. In District 7, the passing rates were 31 percent and 36 percent for English and mathematics, respectively (T. Evans, Gebeloff, & Scheinkman, 2010).

The type of neighborhoods that Dominicans reside in can have important consequences for the outcomes of children that live in those neighborhoods. The literature has consistently documented relationship between a child's environment and his or her performance in school (Aaronson, 1998; Brooks-Gunn, Duncan, Klebanov, & Sealand, 1993; Connell & Halpern-Felsher, 1997; Crane, 1991; Duncan, 1994; Ensminger, Lamkin, & Nora Jacobson, 1996; E. M. Foster & McLanahan, 1996; Halpern-Felsher et al., 1997; Kroneberg, 2008; Owens, 2010). Living in an advantaged neighborhood may affect educational outcomes in a number of ways. For example, advantaged neighbors may provide social networks or ties that facilitate success in education. They may also enforce norms, serve as role models, and socialize youth into pro-educational attitudes (Owens, 2010). Dominicans do not enjoy the benefits of such community forces.

Racial discrimination.

90 percent of Dominicans are of African descent (Haggerty, 1991). Nevertheless, in terms of physical appearance, Dominican skin color ranges from what U.S. cultural standards would call white to black. Dominican children with darker skin face many of the same challenges that their black classmates do. According to immigration sociologist Nancy Foner (2000, p. 159), "Dominicans with African features or dark skin find it especially unsettling to be confused with African Americans, sincere they come from a society where the category black is reserved for the highly disdained Haitians and where to be partly white (the case for most Dominicans) is to be nonblack." As a means to distinguish themselves from African-Americans, many dark-skinned Dominicans cling forcefully to Spanish, thereby possibly hurting their educational progress (Toribio, 2000).

Light-skinned Dominicans also face substantial discrimination. Dominican and Puerto Rican youths in New York claimed police would target them because they were "Spanish." One youth reported, "Since I'm Spanish, the police thought I was up to no good. It didn't matter what I [would have] said. I was Spanish, so I must be guilty" (Solis, Portillos, & Brunson, 2009, p. 46).

These experiences of discrimination can lead to a wide variety of negative mental health outcomes. In a meta-analysis of studies on this subject, Pascoe & Smart Richman (2009) found that perceived discrimination could lead to depressive symptoms and psychiatric distress. In fact, 34.6 percent of Dominican first and second-generation children in San Diego and Miami reported high levels of depressive symptoms in 1995-1996 (Portes & Rumbaut, 2001). In addition, a literature review by Araújo & Borrell (2006) suggested discrimination experienced by Latinos was consistently associated with greater stress

levels and more depressive symptoms. A study by Dawson (2009) also found Dominican immigrant women who experienced major racist events (e.g., educational discrimination) and everyday discrimination (e.g., being harassed in a store) exhibited high stress levels. Several studies also have found that discriminatory experiences among Latino youths were directly associated with a number of negative academic outcomes including lower grade point averages, lower self-esteem, increased drop-out likelihood and lower generalized academic well-being (Ghazarian, 2008; Martinez, DeGarmo, & Eddy, 2004; Shorey, Cowan, & Sullivan, 2002; Szalacha et al., 2003; Umaña-Taylor & Updegraf, 2007).

Teacher expectations.

Discrimination comes from a multitude of sources. Whereas teachers may look upon East Asians favorably, the opposite seems to be the case for Dominican immigrants. The students interviewed in the high school examined by Rosenbloom & Way (2005) reported numerous instances of teacher discrimination. The students felt no matter how they behaved, the teachers perceived them as being "bad" kids. The researchers themselves observed that the teachers appeared generally unconcerned about the emotional or academic well-being of the black and Latino students in the school.

These examples are forms of teacher stereotypes. As discussed in the previous chapter they can be inimical if they result in self-fulfilling prophecies. There does not appear to be any research linking teacher expectations or stereotypes to the academic performance of Hispanic students. However, a recent meta-analysis found that teachers do not seem to have lower expectations for Latino students than for European-American students (Tenenbaum & Ruck, 2007).

Oppositional identities (The role of peers).

In a seminal article, Fordham & Ogbu (1986) proposed that one way African-American children coped with widespread discrimination was by forming opposition identities involving devaluing education. African-American youths who attended school regularly, did their homework, and got good grades are frowned upon by their peers because they are considered "Acting White."

While several ethnographies conclude acting white is a real phenomenon, the quantitative literature has not found much evidence to support the hypothesis. Once controlling for family background, researchers found the attitudes of black students mirrored those of white students. Black students for example, reported spending as much (or more) time on homework as white students that attend the same classes (Cook & Ludwig, 1997; R. F. Ferguson, Ludwig, & Rich, 2001). Fryer & Torelli (2010) found a different result. They found that the acting white does exist for high achieving black children in integrated schools.

Fryer & Torelli's (2010) results are even more disturbing when it comes to Hispanics. They found that a Hispanic with a 4.0 grade point average was the least popular of all Hispanic students. In fact, high-achieving black and Hispanic youths with a GPA above 3.5, actually lose cross-ethnic friends, further exacerbating the acting white problem. This study appears to be the only one that has studied in a quantitative manner the prevalence of oppositional identities in the Hispanic community. This finding may be especially salient for Dominicans. García Coll & Marks (2009) found Dominican children tend to show high levels of in-group social preferences.

Ethnographic research suggests that Dominican youths in the United States have created a new subculture that combines elements of hip-hop and youth culture with elements of Dominican culture, as the use of Spanish. Aspects of urban culture adopted by Dominican youths include the style of dress associated with urban American teenagers: baggy jeans, timberland boots, cornrows, etc (Escobar, 1999). New York rappers of Dominican descent include Fabulous, AZ, Cassidy and Juelz Santana (Meszaros, 2009). Use of the n-word among Dominican teenagers is widespread. According to New York University Professor Juan Flores, the use of the n-word is meant as a reminder of their roots as products of the transatlantic slave trade: "It's just an opportunity to check the power that Black Latinos reflect off each other and the Latino population" (Cepeda, 2008).

This Dominican subculture though is not merely a carbon copy of black urban culture. Instead, it is a syncretism of urban culture and Dominican culture. Bailey (2000) for instance, found that one Dominican-American youth in the course of a five minute interaction switched between at least six different linguistic forms. These forms included Spanish, Dominican Spanish, African-American Vernacular English, Dominican English, American English and Hispanicized English. Additionally, Spanish terms like *cocolo*, *moreo/a*, and *negrito/a*, which translate roughly to "black," are almost always used as terms of endearment (Cepeda, 2008).

Transnational identities.

Oppositional identities may not be the only identity detrimental to educational success for Dominican children. An estimated 710,000 Dominicans in the United States remitted over $1.6 million to the Dominican Republic in 2004 (Multilateral Investment

Fund, 2004). This figure is even more remarkable given that the Dominican population in the U.S. has among the lowest per capita incomes in the nation (Hernández & Rivera-Batiz, 2003). In Washington Heights, many blocks include a shop with phone booths lined up against the walls offering inexpensive calls to the Dominican Republic. U.S. born adult children of Dominican immigrants even have the right to vote in Dominican elections (Foner, 2000).

Many children of Dominican immigrants are sent back to the Dominican Republic. Estimates from Dominican educators and government officials suggest as many as ten thousand students from schools in the United States, mainly from the New York area, are enrolled in the country's schools. Parents send children home for a multitude of reasons. Some immigrant families send children home for grandparents to provide daycare. Others do it to prevent their children from exposure to the sex, drugs, and violence prevalent in New York neighborhoods (Foner, 2000). A Dominican family that immigrated to the United States only to return later remarked:

> We returned when our daughters were ready to start school because we didn't like the school system there. The school day is too long. There are black people. There are drugs. You know. We had always agreed that we would return when our children reached school age. (Bueno, 1997, p. 76).

Another parent added:

> There is a great difference in the educational system of both countries. Parents in the Dominican Republic have more control over school matters. For example, in the case of a sexually abusive teacher in the United States a parent has a rough time getting the school's attention. In the Dominican Republic, on the other hand, the school would take immediate action and dismiss the teacher. (Bueno, 1997, p. 70)

Historian Roger Rouse (1991, p. 162) would argue all of these behaviors reflect a transnational identity:

> In this regard, growing access to the telephone has been particularly significant, allowing people not just to keep in touch periodically but to contribute to decision-making and participate in familial events even from a considerable distance. Indeed, through the continuous circulation of people, money, goods, and information, the various settlements have become so closely woven together that, in an importance sense, they have come to constitute a single community spread across a variety of sites, something I refer to as the 'transnational migrant circuit.'

These people do not belong to a single state; they are transnational (Krohn-Hansen, 2007).

Transnational identities for Dominicans may inhibit education success in America because they encourage Dominican families to resist assimilation. Gray (2001, p. 182) argued that, "Most [Dominicans] arrive with the belief that life in the States is temporary, that as soon as they become financially stable, and soon as their children finish school, they will return to the homeland." To the extent that these transnational identities prevent children from learning the English language or customs of the United States, they may be harmful. On the other hand, the transnational children discussed in this section seem to come from families with highly motivated parents, which may have positive effects on their learning.

5.4. Hypotheses

As in the previous chapter, one of the main contributions of this study is tests of hypotheses of mechanisms and interaction effects related to Dominican immigrant composition effects. To understand the causal pathways involved in Dominican immigrant composition effects, I develop tests for mechanisms. I also discuss the possibility of non-linearities, interaction and sex-specific effects.

Mechanisms

Many of the mechanisms I intend to test in this chapter are presented in the previous chapter on East Asian immigrants. These include social comparison, language difficulties, and mobility. In this section, I summarize these mechanisms and put them into a Dominican context. I also present an additional mechanism, disruptive behavior.

Camaraderie.

As discussed the previous chapter, Dominican immigrant share may have a positive effect on Dominican immigrant achievement if Dominican immigrant children feel a greater sense of camaraderie because there are other children who look like them and face the same challenges. In contrast, Dominican children may experience feelings of isolation and stigmatization is they are in the minority (Conger, 2011). I should observe the achievement of Dominican children rise with the addition of other Dominican children if camaraderie is the mechanism behind Dominican immigrant composition effects.

Disruptive behavior.

If the oppositional identity hypothesis is true, we can expect Dominican children, particularly boys, are more likely to behave disruptively in class than other groups. If bad behavior is the mechanism behind Dominican immigrant composition effects, then as the share of Dominican immigrant children increase, we should see achievement falling for all groups.

Resource diversion.

As most Dominican immigrants in the United States are unskilled and have low levels of education (Torres-Saillant & Hernández, 1998), we can expect Dominican children to enter the American school system at a significant disadvantage. The poor quality of schooling in the Dominican Republic exacerbates this disadvantage. The United Nations Education, Science and Culture Organization reports that education quality in the Dominican Republic is "scarce" and literacy among adults is low ("Dominican education gets failing grade, UNESCO says," 2007).

Because of the disadvantages they face, Dominican children may require additional resources to bring them up to speed with their classmates. These additional resources may be smaller class sizes or may take the form of additional teacher time. If Dominican children divert resources from other students, we can expect that as the share of Dominican children grew the achievement of all children, and Dominican immigrants and non-Dominican immigrants would fall, as each student would receive a lower level of resources.

Language difficulties.

Even more so than for East Asian children, Dominican immigrant children are likely to have difficulties with the English language. My data suggest that the New York City Department of Education classifies almost half of Dominican immigrant children as English language learners. This is not surprising, given the low educational attainment rates of the Dominican foreign-born (Hernández & Rivera-Batiz, 2003). These data indicate that it may be language difficulties that is the mechanism behind Dominican immigrant composition effects. Problems with language may require teachers to devote additional

time to Dominican children at the expense of their non-Dominican classmates. Their presence may also require schools to divert resources toward ESL classes. As with the East Asian example, I test for this possibility by controlling for the share of children who are ELL.

Norms

Related to the bad behavior and opposition identity hypothesis, is the possibility that academic engagement norms contribute to a Dominican immigrant composition effect.[9] According to Coleman (1990, p. 243), "A norm concerning a specific focal action exists when there is a consensus in the social group that the right to control the action is held by others" and not by the actor…"Those holding a norm, claim a right to apply sanctions and recognize the right of others holding the norm to do so." Akerlof & Kranton (2002, p. 1168) proposed adherence to a norm is rational: "Individuals then gain or lose utility insofar as they belong to social categories with high or low social status [in the larger social system] and their attributes and behavior match the ideal of their category."

Social norms are consistent with and potentially responsible for oppositional behavior. As discussed earlier in this chapter, some have suggested that some Dominican and other minority group children may adopt oppositional identities that are comprised of anti-schooling norms. Research on norm enforcement suggests that norm enforcement is non-linear. Norm enforcement becomes self-organizing when a critical mass or tipping point of norm abiders and norm enforcers is formed.

[9] This section drew heavily from (Bishop & Bishop, 2007).

I look at the effect of norms by interacting the share of Dominican children with the share of black children in a cohort. As presented previously, some Dominican children have embraced African-American street culture. As the share of black children in a cohort increase there should be more models for Dominican children to adopt these types of oppositional identities. Evidence for oppositional behavior would take the form of a negative coefficient on the interaction term.

Interaction Effects

I also consider possible interaction effects with grade level. These interaction effects can potentially lend some insight into the mechanism behind a Dominican immigrant composition effect. Take the case of disruptive behavior. If Dominican immigrant children are more disruptive than their peers, I should see that the negative effect of Dominican immigrant composition is stronger in the early grades when the children spend more time with each other in the same classroom. The coefficient on Dominican immigrant share should be negative and larger in magnitude for later grades if norms are behind this effect. Older children are more likely to adopt oppositional identities as they have more experiences on average where individuals from different ethnic groups were treated or behaved differently. It is not clear how grade-level interactions would support or contradict camaraderie or resource diversion.

Sex-Specific Dominican Immigrant Composition Effects

I expect Dominican immigrant composition to have stronger and more negative effects on boys than girls. The theoretical research has suggested the occurrence of two

related and important cultural constructs in the Dominican community: the gender roles of machismo and marianismo. Bull (1998, p. 3) defines machismo as: "being authoritarian within the family, aggressive (Ingoldsby, 1991), promiscuous, virile, and protective of women and children" (Vazquez-Nuttall, Romero-Garcia, & Leon, 1987). Women high on marianismo on the other hand, "…tend to be women who work for their families in the home, serving husbands and sons and enlisting their daughters' assistance; they often tolerate their husbands' sexual indiscretions, and teach their daughters to remain virgins until marriage, leaving the sexual education of their sons to male family members" (Bull, 1998, p. 3).

Guilamo-Ramos et al. (2007) found that these constructs mean that Dominican parents raise boys with more permissiveness than girls. Girls, in contrast, are encouraged to pursue activities within the home. In a low-income, urban environment, these differences may actually have beneficial effects on the academic achievement of Dominican girls. Boys are exposed to more risky behaviors, while girls can focus more on their studies. Consistent with this hypothesis, Dominican boys are more likely to use alcohol, cigarettes, or marijuana than girls are in middle school (Epstein, Botvin, & Diaz, 2002). Dominican males are also far more likely to report discrimination from police than Dominican females (Kasinitz, et al., 2008).

If this machismo behavior is accurate, we can expect that male Dominican immigrant composition effects are more negative than female immigrant composition effects. I test for this possibility by creating separate female Dominican immigrant composition share and male Dominican immigrant composition share variables.

Non-Linearities

There may be diminishing returns to immigrant composition effects. Lazear (2001) proposed a theory that education had aspects of a common-pool resource where congestion effects are potentially important. In other words, a single disruptive student would be very disruptive to learning but a tenth disruptive student would have a smaller effect. This model suggests that there are diminishing negative effects to disruption. If bad behavior is the mechanism behind Dominican immigrant composition effects, we should expect a nonlinear relationship between Dominican immigrant composition and achievement. I test this hypothesis by running separate regressions for cohorts with less than 14 percent Dominican immigrant composition and cohorts with 14 percent or higher. 14 percent as in the East Asian example is roughly between the minimum and maximums in the data. A stronger Dominican immigrant composition effect in the cohorts with relatively fewer Dominicans would be evidence in favor of the disruption hypothesis.

5.5. Variables

The variables used in this set of analyses are the same as the variables used in the East Asian chapter. Table 5.2 presents descriptive statistics for the data used in this chapter. The data come from a sample of 200 schools that exhibited Dominican immigrants in any year they are observed. As previously, a child is considered part of a cohort if he or she took either the ELA or the mathematics exam for the grade.

Table 5.2: Dominican Descriptive Statistics

	Mean	Standard Deviation	Minimum	Maximum	N
Dominican immigrant share	1.825	3.690	0.000	27.933	607,482
Dominican immigrant student	0.018	0.134	0.000	1.000	607,482
Repeater student	0.016	0.126	0.000	1.000	607,482
Male	0.512	0.500	0.000	1.000	607,482
Special education student	0.158	0.365	0.000	1.000	607,482
Free or reduced-price lunch student	0.673	0.376	0.000	1.000	607,482
English language learner	0.125	0.331	0.000	1.000	607,482
Native American	0.005	0.072	0.000	1.000	607,482
Asian	0.146	0.353	0.000	1.000	607,482
Black	0.288	0.453	0.000	1.000	607,482
Hispanic	0.451	0.498	0.000	1.000	607,482
White	0.109	0.312	0.000	1.000	607,482
Standardized ELA score	-0.001	1.010	-5.645	4.335	561,420
Standardized math score	0.024	1.019	-5.785	4.601	598,540

The average share of Dominican immigrant children in a grade cohort in the data is 1.825 percent. This variable ranges from zero to 29.289 percent. Dominicans comprise roughly two percent of the sample. The sample is roughly symmetrical in terms of sex. A majority of students receive free or reduced price lunch. 12.7 percent of the sample is comprised of English language learners. The two largest ethnic groups are African-Americans and Hispanics. The test scores are standardized with mean zero and standard deviation one.

5.6. Results

Reduced-form

I begin by presenting estimates of the reduced-form Dominican immigrant composition effect on achievement. These are the results I consider most interesting for policy as the immigrant variable captures all the aspect of Dominican immigrant composition effects including correlated effects. Column I of Table 5.3 presents results that

only control for individual fixed effects. In column II, I add school-by-grade fixed effects, and in column III, I add school-by-grade-specific linear trends. The estimates of Dominican immigrant composition are roughly the same in each specification in Table 5.3. A 10-percentage point increase in the share of Dominican children in a student's cohort is associated with a 0.08 to 0.09 standard deviation decrease in English-language arts tests scores, holding all else constant.

Table 5.3: Dominican ELA Reduced-Form Results

	I		II		III	
Dominican immigrant share	-0.008	***	-0.009	***	-0.008	***
	(0.002)		(0.002)		(0.002)	
Repeater student	0.240	***	0.244	***	0.241	***
	(0.014)		(0.014)		(0.014)	
Dominican immigrant share * repeater student	-0.028	***	-0.029	***	-0.030	***
	(0.004)		(0.004)		(0.004)	
English language learner	0.046	***	0.057	***	0.058	***
	(0.009)		(0.009)		(0.009)	
Free or reduced price lunch student	-0.058	***	-0.045	***	-0.041	***
	(0.004)		(0.004)		(0.004)	
Special education student	0.178	***	0.171	***	0.168	***
	(0.008)		(0.008)		(0.008)	
R-Squared	0.326		0.348		0.351	
School-by-grade fixed effects			X		X	
School-by-grade specific time trends					X	
Individual fixed effects	X		X		X	
Notes: 1) There are 561,420 observations. 2) All regressions control for grade-by-year fixed effects. 3) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 4) ***p<.01, ** p<.05, *p<.10.						

As in the East Asian regressions, the regressions produce some puzzling ELL, free or reduced price lunch and special education coefficients. These variables have special interpretations. They suggest that an English language learner has larger gains to ELA achievement than a student who is not ELL. R-squared coefficients range from 0.326 in column I to 0.351 in column III.

Table 5.4: Dominican Mathematics Reduced-Form Results

	I		II		III	
Dominican immigrant share	-0.013	***	-0.014	***	-0.014	***
	(0.002)		(0.002)		(0.002)	
Repeater student	0.316	***	0.324	***	0.321	***
	(0.016)		(0.016)		(0.016)	
Dominican immigrant share * repeater student	-0.034	***	-0.035	***	-0.036	***
	(0.005)		(0.005)		(0.005)	
English language learner	-0.085	***	-0.066	***	-0.061	***
	(0.008)		(0.008)		(0.008)	
Free or reduced price lunch student	-0.082	***	-0.064	***	-0.060	***
	(0.005)		(0.004)		(0.004)	
Special education student	0.189	***	0.180	***	0.178	***
	(0.008)		(0.008)		(0.008)	
R-Squared	0.409		0.434		0.445	
School-by-grade fixed effects			X		X	
School-by-grade specific time trends					X	
Individual fixed effects	X		X		X	

Notes: 1) There are 598,540 observations. 2) All regressions control for grade-by-year fixed effects. 3) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 4) ***p<.01, ** p<.05, *p<.10.

Table 5.4 presents the linear-in-means results in mathematics. Similar to the East Asian example, the negative effects of Dominican immigrant composition are stronger in mathematics. The coefficients range from -0.013 to -0.014 depending on the specification. In column II and column III, a 10-percentage point increase in Dominican immigrant composition within a student's grade cohort is associated with a 0.14 standard deviation decrease in student achievement. The coefficients on Dominican immigrant composition are significant at the 0.01 level in each and every specification. They are also on the whole larger than the East Asian coefficients, which may be due to the SES challenges of Dominican children. R-squared coefficients in the mathematics results range from 0.409, controlling only for individual fixed effects to 0.445 controlling for the full set of fixed effects.

Dominicans vs. Non-Dominicans

On average, holding all else constant, Dominican immigrant composition is negatively associated with student achievement, for Dominican immigrants as well as non-Dominican immigrants. In ELA, the coefficient on Dominican immigrant share is only significant in the non-Dominican case which has a much larger sample size. These results are presented in Table 5.5.

Table 5.5: Dominicans vs. Other Children

	ELA				Math			
	Just Dominicans		Other Children		Just Dominicans		Other Children	
Dominican immigrant share	-0.006		-0.009	***	-0.026	***	-0.013	***
	(0.007)		(0.002)		(0.005)		(0.002)	
Repeater student	0.110		0.241	***	0.254	***	0.318	***
	(0.077)		(0.014)		(0.083)		(0.016)	
Dominican immigrant share * repeater student	-0.006		-0.031	***	-0.006		-0.040	***
	(0.008)		(0.004)		(0.008)		(0.005)	
English language learner	0.064	**	0.059	***	-0.001		-0.061	***
	(0.032)		(0.009)		(0.031)		(0.008)	
Free or reduced price lunch student	0.061	**	-0.042	***	-0.083	***	-0.059	***
	(0.027)		(0.004)		(0.026)		(0.004)	
Special education student	-0.145	**	0.172	***	0.109		0.178	***
	(0.071)		(0.008)		(0.088)		(0.008)	
R-Squared	0.476		0.351		0.514		0.445	
N	7,964		553,456		10,959		587,581	

Notes: 1) All regressions control for individual, grade-by-year and school-by-grade fixed effects and school-by-grade-specific time trends. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) ***p<.01, ** p<.05, *p<.10. 4) R-squared coefficient is calculated based on a individual demeaned model and dummy variables for grade-by-year, school-by-grade fixed effects and school-by-grade specific time trends.

Dominican immigrant composition appears to have a more negative effect for Dominican children in mathematics than for non-Dominican immigrant children. The effect on Dominican immigrant composition on Dominican children is twice the effect on other children. Each 10 percentage point increase in Dominican immigrant share within a student's grade-cohort is associated with a 0.26 standard deviation decrease in mathematics achievement for Dominican immigrant children, versus only a 0.13 standard deviation decrease for other children.

These results suggest that Dominican immigrant children have negative effects on achievement for Dominican children, non-Dominican children, and children as a whole. These phenomena may suggest that Dominican immigrant children are somehow more disruptive than other children are, damaging the educational experience of all children. Resource diversion mechanism may also be occurring. As in the East Asian case, it may be that as the share of Dominican immigrant children grow, they consume a disproportionate amount of resources vis-à-vis their peers and reduce the amount available for all children, creating this negative effect.

ELL

What role do language difficulties play in these negative Dominican immigrant composition effects? The results in Table 5.6 suggest, very little. Controlling for the share of English language learners in a cohort does not appreciable change the estimates of immigrant composition effects. This is not consistent with the resource diversion hypothesis, as one would expect one of the main reasons immigrant children consume resources is because of ELL.

Table 5.6: Dominican Regressions Controlling for ELL Share

	ELA		Math	
Dominican immigrant share	-0.009	***	-0.016	***
	(0.002)		(0.002)	
Repeater student	0.239	***	0.318	***
	(0.014)		(0.016)	
Dominican immigrant share * repeater student	-0.030	***	-0.036	***
	(0.004)		(0.005)	
English language learner	0.056	***	-0.063	***
	(0.009)		(0.008)	
Free or reduced price lunch student	-0.041	***	-0.060	***
	(0.004)		(0.004)	
Special education student	0.168	***	0.177	***
	(0.008)		(0.008)	
ELL share	0.002	***	0.002	***
	(0.001)		(0.001)	
R-Squared	0.351		0.445	
N	561,420		598,540	

Notes: 1) All regressions control for individual, grade-by-year and school-by-grade fixed effects and school-by-grade-specific time trends. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) ***p<.01, ** p<.05, *p<.10. 4) R-squared coefficient is calculated based on a individual demeaned model and dummy variables for grade-by-year, school-by-grade fixed effects and school-by-grade specific time trends.

ELL share is positive and significant for both ELA and mathematics. In the East Asian case, only ELA had a positive and significant coefficient. This positive finding is interesting and may suggest two possibilities. One, teachers are better able to streamline their instruction methods to children who are ELL when there are more children who are ELL. Another possibility is that with additional ELL students come additional resources, which are more than enough to counteract any negative effect of ELL status.

Other Composition Variables

Specification I of Table 5.7 adds additional control variables for ethnic composition, ELL, free or reduced price lunch, and special education composition. As in the East Asian case, the addition of these variables has little effect on the coefficient of

Dominican immigrant composition. However, the addition of region of origin composition variables results in a sharp decrease in the magnitude of Dominican immigrant composition effects.

Table 5.7: Dominican Regressions with Other Composition Variables

	ELA				Math			
	I		II		I		II	
Dominican immigrant share	-0.008	***	-0.002		-0.014	***	-0.004	*
	(0.003)		(0.002)		(0.002)		(0.002)	
Repeater student	0.231	***	0.216	***	0.304	***	0.282	***
	(0.014)		(0.014)		(0.015)		(0.016)	
Dominican immigrant share * repeater student	-0.030	***	-0.028	***	-0.034	***	-0.033	***
	(0.004)		(0.004)		(0.005)		(0.005)	
English language learner	0.064	***	0.073	***	-0.049	***	-0.034	***
	(0.009)		(0.009)		(0.008)		(0.007)	
Free or reduced price lunch student	-0.010	***	-0.008	***	-0.005	***	-0.001	
	(0.003)		(0.003)		(0.002)		(0.002)	
Special education student	0.156	***	0.149	***	0.157	***	0.145	***
	(0.008)		(0.008)		(0.007)		(0.007)	
Asian share	0.001		-0.001		0.005	***	0.002	***
	(0.001)		(0.001)		(0.001)		(0.001)	
Black share	0.001	*	0.001		0.002	***	0.002	***
	(0.000)		(0.000)		(0.000)		(0.001)	
Hispanic share	0.001	*	0.001		0.003	***	0.003	***
	(0.000)		(0.000)		(0.001)		(0.001)	
Native American share	-0.000		0.008	***	-0.003		0.005	**
	(0.004)		(0.002)		(0.004)		(0.002)	
English language learner share	0.003	***	-0.002	***	0.003	***	-0.004	***
	(0.001)		(0.000)		(0.001)		(0.001)	
Free or reduced price lunch share	-0.003	***	-0.003	***	-0.006	***	-0.005	***
	(0.000)		(0.000)		(0.001)		(0.00)	
Special education share	0.002	***	0.002	***	0.003	***	0.004	***
	(0.000)		(0.000)		(0.001)		(0.001)	
Other region variables	No		Yes		No		Yes	
R-Squared	0.353		0.356		0.452		0.458	
N	561,420		561,420		598,540		598,540	

Notes: 1) All regressions control for individual, grade-by-year and school-by-grade fixed effects and school-by-grade-specific time trends. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) ***p<.01, ** p<.05, *p<.10. 4) R-squared coefficient is calculated based on a individual demeaned model and dummy variables for grade-by-year, school-by-grade fixed effects and school-by-grade specific time trends.

A 10 percentage point increase in Dominican immigrant composition holding constant the other composition variables results in a 0.002 standard deviation decrease in achievement in ELA and a 0.004 standard deviation decrease in mathematics. The mathematics estimate is significant at a 0.10 level. As in the East Asian case, schools with increases in Dominican immigrant composition also appear to have increases in

immigration in general. This general growth in immigrant composition explains some, but not all, of the reduced-form Dominican immigrant composition effect.

Unlike with the East Asian case however, Dominican immigrant composition never becomes positive despite the addition of other composition variables. This suggests an important difference between East Asians and Dominicans, and the importance of culture in immigrant composition effects. The negative effect of Dominican immigrant composition, especially in mathematics is consistent with a number of mechanisms including disruptive behavior and social norms, both of which would predict a negative coefficient on Dominican immigrant share.

Non-Linearities

Table 5.8 presents regression results that examine non-linearities in Dominican immigrant composition effects. In ELA at least, there does appear to be some support for this hypothesis. Though the results are noisy, they suggest that Dominican immigrant composition effects are strongest in cohorts with less than 14 percentage point Dominican immigrant share. This finding is consistent with the disruption hypothesis. In other words, there are diminishing returns to disruption. Each additional Dominican child has a smaller and smaller effect on achievement.

Table 5.8: Non-Linear Dominican Immigrant Composition Effects

	ELA				Math			
	<14%		>=14%		<14%		>=14%	
Dominican immigrant share	-0.009	***	-0.004		-0.014	***	-0.013	**
	(0.002)		(0.008)		(0.002)		(0.006)	
Repeater student	0.233	***	-0.291		0.306	***	-0.049	
	(0.014)		(0.550)		(0.015)		(0.309)	
Dominican immigrant share * repeater student	-0.038	***	0.018		-0.049	***	0.013	
	(0.005)		(0.034)		(0.006)		(0.017)	
English language learner	0.058	***	0.078		-0.066	***	0.205	***
	(0.009)		(0.045)		(0.008)		(0.034)	
Free or reduced price lunch student	-0.042	***	0.033	*	-0.060	***	-0.020	
	(0.004)		(0.019)		(0.004)		(0.037)	
Special education student	0.169	***	0.069	*	0.181	***	-0.090	
	(0.008)		(0.054)		(0.008)		(0.056)	
R-Squared	0.349		0.464		0.445		0.479	
N	551,702		9,718		587,154		11,386	

Notes: 1) All regressions control for individual, grade-by-year and school-by-grade fixed effects and school-by-grade-specific time trends. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) ***p<.01, ** p<.05, *p<.10.

Sex-Specific Dominican Immigrant Composition Effects

Table 5.9 presents sex-specific Dominican immigrant composition effect results. The results are different based on the particular exam. Male Dominicans have stronger effects in ELA, but the roles are reversed in mathematics.

Table 5.9: Sex-specific Dominican Immigrant Composition Effects

	ELA		Math	
Female Dominican immigrant share	-0.007	*	-0.021	***
	(0.004)		(0.004)	
Male Dominican immigrant share	-0.012	***	-0.007	*
	(0.003)		(0.004)	
Repeater student	0.271	***	0.351	***
	(0.016)		(0.018)	
Female Dominican immigrant share * repeater student	0.026	**	0.020	
	(0.011)		(0.013)	
Male Dominican immigrant share * repeater student	0.026	**	0.012	
	(0.011)		(0.012)	
English language learner	0.059	***	-0.060	***
	(0.009)		(0.008)	
Free or reduced price lunch student	-0.041	***	-0.059	***
	(0.004)		(0.004)	
Special education student	0.169	***	0.179	***
	(0.008)		(0.008)	
R-Squared	0.351		0.444	
N	561,420		598,540	

Notes: 1) All regressions control for individual, grade-by-year and school-by-grade fixed effects and school-by-grade-specific time trends. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) ***p<.01, ** p<.05, *p<.10.

Grade Level Analyses

Similar to the East Asian example, Dominican immigrant composition appears to have a stronger and more negative effect for younger children. The results are significant in all specifications in Table 5.10. However, the effect of Dominican immigrant composition is about twice as large in grades three to five than in grades six to eight in mathematics. These findings are similar to the East Asian set of results. They suggest that there is a stronger negative effect if children spend more time with each other in the same environment that when they do not.

Table 5.10: Dominican Grade Level Interactions

	ELA				Math			
	Grades 3-5		Grades 6-8		Grades 3-5		Grades 6-8	
Dominican immigrant share	-0.010	***	-0.007	***	-0.018	***	-0.010	***
	(0.004)		(0.003)		(0.003)		(0.002)	
Repeater student	0.348	***	0.059	***	0.439	***	0.081	***
	(0.016)		(0.019)		(0.019)		(0.017)	
Dominican immigrant share * repeater student	-0.020	***	-0.009	**	-0.029	***	-0.006	*
	(0.006)		(0.003)		(0.008)		(0.004)	
English language learner	0.069	***	0.044	***	-0.082	***	-0.027	**
	(0.013)		(0.013)		(0.010)		(0.012)	
Free or reduced price lunch student	-0.076	***	-0.014	***	-0.104	***	-0.023	***
	(0.005)		(0.004)		(0.006)		(0.005)	
Special education student	0.203	***	0.100	***	0.218	***	0.091	***
	(0.010)		(0.011)		(0.009)		(0.011)	
R-Squared	0.329		0.476		0.375		0.403	
N	281,111		303,385		280,309		295,155	

Notes: 1) All regressions control for individual, grade-by-year and school-by-grade fixed effects and school-by-grade-specific time trends. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) ***p<.01, ** p<.05, *p<.10.

Threats to Internal Validity

In this section, I review some threats to internal validity that may bias the estimates of Dominican immigrant composition effects. I also present the results of some regressions that attempt to test for the existence of these threats.

Cohort Selection.

Table 5.11: Dominican Balancing Test

English language learner	-0.141	**
	(0.058)	
Free or reduced price lunch student	0.036	
	(0.049)	
Special education student	0.066	
	(0.044)	
Male	-0.016	
	(0.030)	
Asian	-0.102	
	(0.066)	
Black	-0.043	
	(0.053)	
Hispanic	-0.103	**
	(0.048)	
Native American	-0.007	
	(0.155)	
Standardized ELA score	0.009	
	(0.020)	
Standardized math score	-0.005	
	(0.021)	
R-Squared	0.177	
F-Statistic	1.92	**
N	12,454	

Notes: 1) Regression controls for school-by-grade and grade-by-year fixed effects. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) Regression controls for Dominican immigrant status and whether the student ever repeated a grade. 4) ***p<.01, ** p<.05, *p<.10. 5) Variables are cluster means.

As in the East Asian regressions, one has to be concerned about the presence of cohort selection. The test for cohort selection is the same as the one in previous chapter. The results of this balancing test provides some limited evidence to the presence of cohort selection in these analyses. Two of the ten variables reach significance in Table 5.11. The partial F-test of the joint significance of the variables in Table 5.11 is 1.92 and significant at the 0.05 level. However, the results are by no means conclusive either in support or in opposition to the hypothesis of cohort selection.

Attrition.

The variation used in theses analyses is derived largely from individuals who have been in the system the longest. If this group is systematically different from individuals who have been in the system a shorter-time, selection bias may influence the estimates of Dominican immigrant composition effects. I test for this possibility by running separate regressions for individuals with 1-3 observations and individuals with 4-6 observations. Table 5.12 reports these results.

Table 5.12: Dominican Tests for Attrition

	ELA				Math			
	<=3		>3		<=3		>3	
Dominican immigrant share	-0.006	**	-0.013	***	-0.007	***	-0.016	***
	(0.003)		(0.002)		(0.003)		(0.002)	
Repeater student	0.342	***	0.209	***	0.421	***	0.276	***
	(0.020)		(0.016)		(0.020)		(0.017)	
Dominican immigrant share * repeater student	-0.045	***	-0.019	***	-0.038	***	-0.034	***
	(0.006)		(0.004)		(0.007)		(0.006)	
English language learner	0.068	***	0.068	***	-0.031	***	-0.061	***
	(0.011)		(0.016)		(0.008)		(0.014)	
Free or reduced price lunch student	-0.025	***	-0.024	***	-0.041	***	-0.017	***
	(0.004)		(0.005)		(0.004)		(0.005)	
Special education student	0.127	***	0.140	***	0.136	***	0.122	***
	(0.009)		(0.012)		(0.008)		(0.011)	
R-Squared	0.343		0.422		0.433		0.550	
N	440,620		120,800		470,970		127,570	

Notes: 1) All regressions control for individual, grade-by-year and school-by-grade fixed effects and school-by-grade-specific time trends. 2) Huber-White robust standard errors adjusted for clustering by school-by-grade in parentheses. 3) ***p<.01, ** p<.05, *p<.10.

The Dominican immigrant results in Table 5.14 are negative and significant in each and every specification, though they may be stronger for students who have been in the system longer.

5.7. Summary and Discussion

Perhaps, the most striking aspect of the results presented in this chapter is how similar they are to the results in the East Asian chapter. In both chapters, immigrant

composition has a significant and negative effect on student achievement. These results are consistent despite how different the two groups are.

The literature on Dominican immigrant achievement paints a grim picture. While observable characteristics like limited English proficiency, special education, and poverty explain most of the disadvantage in test scores that Dominican immigrant children experience, a small portion remains unobserved. This chapter suggests that Dominican segregation may play a role in this unobserved component. As more Dominican immigrant children surround Dominican immigrant children, their achievement appears to fall, as does the achievement of all children.

This effect may be overstated, however. Controlling for a large set of regional composition variables significantly reduces the magnitudes of the coefficients on Dominican immigrant composition. Like the East Asians, the presence of other types of immigrants appears to explain much of the reduced-form Dominican immigrant composition effect. Unlike the East Asians however, in mathematics the coefficient on Dominican immigrant composition remains negative and significant at a 0.10 level. This finding is consistent with a number of mechanisms including disruptive behavior and norms.

Chapter 6

CONCLUSION

Summary

Immigration is no longer just a big city issue. States like North Carolina, Alabama, and Georgia saw large increases in foreign-born population during the last two decades (Singer, 2009). One major issue that involves immigration revolves around the cost of providing public services to them. Another issue involves segregation. This study has the potential to inform the larger debate in this area by estimating the effects immigrant children have on their schoolmates. If immigrant children negatively affect the achievement of their schoolmates, they serve to increase the cost of education. However, if they positively impact the achievement of their schoolmates, they could act as a positive externality and reduce the cost of providing education to them.

I study the issue of immigrant composition effects by focusing on a setting that has grappled with the issue of immigration since its founding: New York City. The lessons learned from New York City have the potential to inform the debate in other areas of the United States. New York is arguably the ideal place to study immigration. Immigrant children in New York City schools hail from nearly 200 countries and speak over 160 languages (*Immigrant children in New York City Public Schools: Equity, Performance and Policy*, 2005).

The diversity of immigrants in New York is reflective of the diversity of immigrants in the United States. For this reason, it does not make sense to focus on immigrants as a single monolithic group. Immigrant families arrive to the United States

with different levels of education, wealth, and proficiency in the English language. Children born in different countries live in different neighborhoods in New York and in the U.S. They attend different schools and have different average test scores. On one side of the immigrant socioeconomic spectrum are immigrants from East Asia, who on average have high levels of income and education. On the other side are immigrants from the Dominican Republic, who come to the United States with low levels of education and income. These two groups are the foci of this study.

Children from East Asia are in many ways an American success story. Despite the challenges of adapting to a new society, children from this region have higher than average test scores and grade point averages, which is only partially explained by socioeconomic status. The advantage of East Asian immigrant children may be the results of culture. Some have argued that East Asian families bring with them to the United States a Confucian worldview that honors education and hard work. This Confucian worldview may also interact with the ethnic communities East Asian families embed themselves in. It may also have something to do with the interactions between East Asian children.

The story of Dominican immigrant children is far less sanguine than that of East Asian immigrant children. Dominican immigrant children have test scores that are significantly below average. Many Dominican immigrant families have only one parent, who is likely to be poor and uneducated. These factors explain most but not all of the relatively poor performance of Dominican immigrant children. Other possible explanations are community forces, racial discrimination, teacher expectations, and oppositional and transnational identities. Because East Asian and Dominican immigrants are on opposite

ends of the socioeconomic spectrum, together, these two groups paint a reasonably complete picture of immigrant peer effects.

This study integrates the research on immigration and peer effects. Peers are members of the same social group. Peer effects occur when the outcomes of an individual (e.g. test scores) are influenced by the behaviors, attitudes, or characteristics of other members of the peer group (D. N. Harris, 2010). The estimation of peer effects is a formidable task. These challenges were presented in chapter two and include the intractable reflection problem, the knotty correlated effects problem, and the formidable selection problem.

The selection problem involves the fact that Dominican and East Asian immigrant children are not randomly distributed in schools and neighborhoods. The key is to isolate the effect of immigrant composition on student achievement from omitted variables that may be correlated with the presence of immigrant children and that affect student test scores. This means finding a random source of immigrant variation. This study uses credibly exogenous variation within cohort composition to approximate random variation.

Estimating these effects involves controlling for a set of overlapping fixed effects in the form of individual, school-by-grade, and grade-by-year fixed effects in a regression. Controlling for individual fixed effects controls for all variables observed an unobserved associated with a particular student that do not change over time. School-by-grade fixed effects control for variables like school quality that are different across schools that do not change over time. Grade-by-year fixed effects control for all variables within a grade between years. The variation that is identified under this specification is the year-to-year

variation in immigrant composition as student progresses with a cohort. This method provides powerful protection against selection.

The results of both the East Asian and Dominican regressions are conspicuous in their similarity. Both East Asian and Dominican immigrant composition have negative and significant effects on achievement. These findings are consistent with most of the research on immigrant composition effects (e.g. Cho, 2011; Di Paolo, 2010; Friesen & Krauth, in press; Gould, et al., 2005). Both types of immigrant composition have stronger effects in mathematics. East Asian immigrant composition has negative effects on East Asian immigrant children as well as other children. Likewise, Dominican immigrant composition has negative effects on Dominican immigrant children as well as other children. The results collectively suggest there is a negative effect of immigrant composition that is independent of ethnicity and culture.

This finding is in essence a reduced-form measure of immigrant composition effects, as it does not control for other composition variables. For policy purposes however, this reduced-form variable may be the one to target. Both East Asian immigrants and Dominican immigrants bring with them a set of variables that are correlated with their presence that may not be separable.

The addition of these other composition variables sharply changes the results for both East Asian and Dominican immigrant composition. For both groups, a large part of the negative effect for both East Asian and Dominican immigrant composition is the result of the presence of other immigrants. Controlling for these additional variables makes the coefficient on East Asian immigrant composition zero in ELA and positive and significant in mathematics. For the Dominican regressions, these additional control variables

significantly reduce the magnitude of Dominican immigrant share coefficients but they remain negative in both ELA and mathematics, though only the mathematics score is significant. The different findings between East Asians and Dominicans in these regressions suggest a large role for culture. Cultural differences between these two groups create different types of composition effects.

Policy Implications

The results lead to several policy implications. The American public school has long held a role in integrating New Americans into the fabric society. These results suggest that if it is continue serving this function, additional resources should be devoted to immigrant children, particularly in earlier grades to ensure they do not have negative effects on their peers. These additional resources may take the form of ESL and civics classes but may also include early childhood education. Immigrant children are less likely to participate in nursery or preschool programs than native-born children (Haskins, Greenberg, & Fremstad, 2004), despite evidence that early education has profound positive long-term cognitive effects (Heckman, 2011).

A less publicized issue regarding immigrant children involves their mental health. Immigrant children are likely to have experienced mental stress pre- and post-migration. Some immigrant children have experienced traumatic exposure in their homeland in the form of war, poverty, or natural disasters. When immigrant families leave their homelands, they distance themselves from the emotional support of family and kinship networks. Upon arriving in the United States, many immigrant children suffer from discrimination and prejudice. They may also suffer from "acculturation stress." Immigrant children have to

balance the need navigate the mainstream culture in school but also stay loyal to one's family and ethnic community (Pumariega, Rothe, & Pumariega, 2005). Schools are an ideal setting to deliver mental health services to immigrant children. Children spend a significant amount of their time in school and schools have the ability to reach entire families. Furthermore, health and education are intricately linked. Better health outcomes lead to better educational outcomes and vice-versa (Allensworth, Lawson, Nicholson, & Wyche, 1997).

Without the additional resources, a second-best option may be Newcomer Schools. These are schools designed to serve the needs of immigrant children. As one would expect, English language acquisition is a large part of these schools' curricula (Feinberg, 2000). Boyson & Short (2003, pp. 5-6) listed four reasons for establishing newcomer secondary schools:

- The literacy needs of English language learners can be addressed more effectively in newcomer classes than in classrooms that include both literate and non-literate students.
- A welcoming and nurturing environment is beneficial to older immigrant students (those of secondary school age, generally 12–21 years old) who may have limited prior experience with schooling.
- Gaps in the educational backgrounds of middle and high school immigrant students can be filled more readily and learning of core academic skills and knowledge can be accelerated in the newcomer program.
- The chances of educational success for immigrant students are enhanced when connections between the school and students' families and communities are established and reinforced.

For the most part, students attending these schools appear to have had impressive outcomes (Feinberg, 2000; Hertzberg, 1998; Olsen, 1997; Short, 2002). Hertzberg suggested that one of the factors behind these schools' successes had to do with the safe and welcoming environment for immigrant students these schools created. In the context of this study, these schools may serve to shield native-born children from the negative effects of

immigrant children. Given that there are many more native-born children than foreign-born, the newcomer school may be welfare enhancing because the total negative effect of immigrant children on native-born children is likely larger than the total negative effect of immigrant children on other immigrant children. While the overall result may be efficient, newcomer schools are likely to exacerbate achievement gaps between native and foreign-born children. Widespread expansion of newcomer schools may also face legal challenges due to the segregation of native and foreign-born children.

Study Limitations

This study only looks at one measure of immigrant composition effects: test scores. While test scores are an important student outcome, they are not the only outcome of importance. Immigrants and their children were directly responsible for growth and industrial transformation of the United States during the turn of the 20th century (Hirschman & Mogford, 2009). In education, immigrant children and their families inspired school health programs, civics classes, and ESL classes, programs that are taken for granted today. Immigrants brought with them the model of trade schools, which became vocational schools in the United States (Celis, 2006).

This study is limited in other ways. The variation in East Asian and Dominican immigrant composition is limited. Whether the effect of immigrant composition demonstrated in this study is different for schools that see large influxes of immigrants is not clear. This study only examines two immigrant groups. There may be other immigrant groups that this study does not examine that have positive effects on achievement. The qualitative research reviewed in this dissertation suggests that there are similarities between

immigrant children and children of immigrants. This study is not able to investigate this issue. Finally, there may be some error in measuring the composition variables due to the way the data are structured.

Suggestions for Further Research

Because of the limitations discussed in the previous section, there are many ways this study can be improved. Additional data on parental country of origin would allow me to compare the effects of children of immigrants and immigrant children. Data on year of entry would be helpful in analyzing the differences in composition effects between recent immigrants and immigrants who arrived much earlier. Data on when students started school would make it possible to create more precise measures of cohort composition. Finally, additional characteristics on students could allow me to test additional hypotheses relating to mechanisms.

A better approach to investigating the mechanisms behind immigrant composition effects would be use qualitative methods of inquiry. An ethnography of a school located in an immigrant enclave for example can elucidate how culture interacts with immigrant composition effects. Observing classroom dynamics can lead to data on how the presence of immigrant children affects classroom learning. Interviews with students and teachers can provide insight into how teachers view students from different ethnic groups and how students view each other and their teacher.

Finally, this study can be improved by extending it to other areas of the United States. New York City remains an outlier in terms of the level and diversity of its immigrants. Immigration has also been a longstanding phenomenon in New York. A study

of impact of immigrants on their schoolmates in new areas of immigration would be an interesting and valuable contribution and illuminate how the generalizable the New York City results are.

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