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From Parent to Child? Transmission of Educational Attainment Within Immigrant Families: Methodological Considerations

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Abstract One in five U.S. residents under the age of 18 has at least one foreign-born parent. Given the large proportion of immigrants with very low levels of schooling, the strength of the intergenerational transmission of education between immigrant parent and child has important repercussions for the future of social stratification in the United States. We find that the educational transmission process between parent and child is much weaker in immigrant families than in native families and, among immigrants, differs significantly across national origins. We demonstrate how this variation causes a substantial overestimation of the importance of parental education in immigrant families in studies that use aggregate data. We also show that the common practice of "controlling" for family human capital using parental years of schooling is problematic when comparing families from different origin countries and especially when comparing native and immigrant families. We link these findings to analytical and empirical distinctions between group- and individual-level processes in intergenerational transmission.

Keywords Educational transmission · Assimilation · Immigration · Second generation · Ecological fallacy

Introduction

The initial members of the "new" immigration wave following the U.S. Immigration and Nationality Act of 1965 have now settled, and their U.S.-born children have come

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of age. Although the distribution of immigrants in terms of human capital is bimodal, it is especially the large group of immigrants with little formal education that raises concerns about the impact of immigration on social inequality. With the children of immigrants currently composing more than 20 % of the U.S. population under age 18, the extent to which this population will inherit the educational characteristics of their parents is significant for the immediate and long-term future of ethnic stratification in the United States.

Although the strength of intergenerational educational transmission is well documented for the general U.S. population (Blau and Duncan 1967; Mare 1981), until recently, transmission within immigrant families was difficult to assess because of a lack of representative, large-scale data identifying the educational attainments of immigrants and their adult children. Instead, researchers relied on aggregate data, using national origin or self-reported ethnicity to link generations by regressing the average years of educational attainment of the children of immigrants on the average years of educational attainment of immigrants of the same origins in previous survey years (Borjas 1993, 2006; Card 2005; Card et al. 2000; Park and Myers 2010; Smith 2003). Even as individual-level data on immigrants and their children became available, the majority of the literature on second-generation attainment has focused on differences in attainment controlling for parental background rather than examining the relationship between parental and child educational attainment itself (for research from the past five years, for instance, see Feliciano 2012; Greenman 2013; Haller et al. 2011; Harris et al. 2008; Kasinitz et al. 2008; Keller and Tillman 2008; Thomas 2009; Waters et al. 2010; Xie and Greenman 2011).

This article provides a first methodological demonstration of potential biases emerging from both of these common approaches to the study of educational inequality among the immigrant second generation. A recent review of European research by Heath et al. (2008) suggests that the status transmission processes may differ across immigrant origin groups, and Alba et al. (2011) also pointed to the fact that educational attainment of immigrants of different origins are unlikely to be comparable. However, neither these scholars nor the studies they reviewed have systematically evaluated the potential for bias when the educational attainments of different immigrant groups are treated as commensurate. We expand on these initial warnings, outlining in detail how both of these methods rely on the assumption that educational transmission is uniform between immigrants of different origins and, when natives are compared, between immigrant and native families as well.

We demonstrate that this assumption is not upheld in the U.S. case. The resulting bias in estimates of intergenerational transmission and expected years of education is severe. Using the educational attainment of parent–child dyads, we find the regression coefficient of children's on parents' years of education is, on average, 0.11 but ranges from close to 0 in some groups to as high as 0.37. This implies a generally weak relationship between parental and child educational attainment within immigrant families.[1] In contrast, when aggregating the very same data and using weighted averages of national origin groups, as has been done in prior research, we find much higher estimates: an association between foreign-born parents' and their children's education

[1] This has also been shown using individual-level data in Denmark (Nielsen et al. 2003), Sweden (Hammarstedt and Palme 2006), and Germany (Dustmann 2008; Gang and Zimmermann 2000).

of 0.43. We also show that when parental education enters a model as a control variable, models that assume a homogeneous relationship between parental and child education distort national origin comparisons.

We connect these findings to research that suggests significant variation in the link between parental education and the larger set of variables that shape the educational attainment of children: between immigrants and natives on the one hand, and across immigrants from different national origins on the other. We also establish two correlates of the strength of educational transmission: parent–child links are stronger in groups with higher average education, and links are weaker in groups with higher within-group variation. In our conclusions, we discuss the relationship between these correlates and current understandings of national origin variation in second-generation attainment.

Variation in Intergenerational Transmission

Sociologists studying migration have long been interested in intergenerational change among immigrants, writing extensively on the earlier "great wave" of migration at the turn of the century (Gordon 1964; Park 1930; Warner and Srole 1945). These early theories conceived of assimilation as a group-level process, predicting a sequence of improving group relations with the disappearance of ethnic groups as its endpoint. Even Gordon's influential treatise on the subject is framed as a corrective to the lack of "research and theoretical attention to the nature and implications of American communal *group life*" (1964:5 emphasis added).

These approaches were extraordinarily productive, guiding immigration research for the better part of a century, yet they do not clearly delineate between individual- and group-level processes. Assimilation is seen as a convergence of immigrant groups toward the "core" and the disappearance of prejudice and discrimination. At the same time, it encompasses processes that are clearly individual in nature, such as intermarriage, shifts in participation, and identification.

It is an achievement of recent revisions of assimilation theory (Alba and Nee 2003; Portes and Rumbaut 2001) to clearly delineate these two constitutive aspects of intergenerational change. On the one hand, Alba and Nee developed an analytical model that distinguished individual-level socioeconomic mobility, intermarriage, and residential assimilation (boundary crossing) from collective changes in the salience of ethnicity for immigrant groups as a whole (boundary blurring or shifting). On the other hand, segmented assimilation scholars (Haller et al. 2011; Portes and Rumbaut 2001; Zhou et al. 2008) have distinguished individual- and group-level processes and demonstrated how opportunities for socioeconomic advancement for immigrant families are contingent on the characteristics and opportunities available to their ethnic group as a whole: the context of reception. For immigrant groups on the upper end of the bifurcated educational distribution, most of whom enjoy positive or neutral societal perception and documented legal status, the status transmission process is expected to unfold in a pattern similar to that of the native population. However, at the lower end of the educational distribution, group-level boundaries and ethnic resources will play a greater role.

In response to these theoretical developments, sociologists have gathered several new metropolitan-level surveys of the children of immigrants. These data, which we also rely on here, enable the analytic distinction between group- and individual-level

characteristics in predicting second-generation educational attainment, and more recent studies provide strong evidence for group-level variation in the status transmission process.

Sources of Group-Level Variation in Intergenerational Transmission

A growing literature now addresses how the relative importance of parents' education for the educational attainment of their children may vary depending on the importance of extrafamilial or "group-level" factors that co-determine educational attainment—processes that are often grouped under the labels "neighborhood," "school," and "peer" effects. Certainly, extrafamilial influences matter for education in natives and immigrant families alike. Yet, in studies of the educational trajectories of the children of immigrants, additional factors come into play.

Group-Level Effects

One set of factors pertains to the context of reception. Including variables such as host society perceptions, discrimination, and (parental) legal status as well as the characteristics of the coethnic community, this concept plays an important role in the segmented assimilation hypothesis. Migrants from some countries (e.g., Cuba, USSR, Vietnam) were given easy access to citizenship and other privileges that foster upward mobility (Portes and Rumbaut 2001). In contrast, other migrant streams are heavily undocumented, facing not only significant barriers in the labor market and exclusion from a number of public services but also a "ceiling" effect on the educational and occupational attainment of the young children who migrate with them (Bean et al. 2011; Gonzales 2011). For the children of such disadvantaged origin groups, foremost Mexican Americans, attempts at upward mobility may be flattened into a "working class" incorporation, with the children of both higher- and lower-skilled parents failing to attain middle class status (Luthra and Waldinger 2013). Societal perceptions also vary and, as psychological research points out, may be consequential for academic performance (Steele and Aronson 1995). Some research had argued that positive stereotypes of minority group academic performance weaken the link between low parental education and low child education (Lee and Zhou 2013), whereas negative stereotypes can strengthen it, decreasing mobility (Conchas 2001; Gonzales et al. 2002; Waters 1999).

Social networks and collective efficacy also play an important role in the larger literature on the effects of local context on educational outcomes (Sampson et al. 1999). Although important for migrants and nonmigrants alike, these networks are arguably tighter for migrants. Examples are extensive ethnic "shadow schooling" systems commonly found in Asian immigrant enclaves (Foner 2002; Kasinitz et al. 2008; Zhou and Kim 2006), or the access to elite private coethnic high schools for the children of Cuban migrants in Miami (Portes and Rumbaut 2001). Another example is the enforcement of high attainment as a local norm within immigrant communities (Kao and Tienda 1995). Those growing up in an environment where going to college is the norm and professional occupations are seen as a minimum level of achievement, such as the children of Chinese immigrants in New York, feel a stronger social pressure and expectation of high attainment (Kasinitz et al. 2008). Especially for immigrant

parents with low levels of education, ethnic social networks can provide an environment for their children that will isolate them from negative influences and emphasize educational attainment, weakening the link between low parental attainment and low offspring attainment found in the general population.

These "group effects" will operate more or less strongly depending on the spatial dispersion of the group and the ethnic resources available in immigrant enclaves (Borjas 1992; Gibson 1988; Kasinitz et al. 2008; Zhou and Kim 2006). Mexican-origin immigrants, who are overwhelmingly working class, are less likely to have access to coethnic social networks that span social classes (Bean and Stevens 2003). By contrast, socioeconomically more diverse national origin groups, such as the Koreans and Chinese (Zhou et al. 2008), benefit from cross-class ties. For highly skilled immigrants or those who are less geographically concentrated, such as those from the Philippines (Le Espiritu 2003), ethnic resources may play a smaller role; in such groups, the effect of parental characteristics may be similar in magnitude to the patterns found in native families.

Variation in the Concept-Indicator Link Across Groups

In addition to group-level effects related to the context of reception and characteristics of the immigrant ethnic community in the receiving country, the extreme discrepancies in educational access and quality across immigrant sending countries provide another reason both to expect a weaker relationship between parental and child educational attainment among the children of immigrants in the United States compared with natives as well as to expect differences in the strength of this relationship between immigrants of different origins. First, parental education (in years) is a distal measure of parental human capital: years of education are not directly passed from parent to child. Rather, parental education is meant to provide a measurable indicator for the "knowledge, skills, health, or values" (Becker 2008) of parents that are expected to influence the human capital acquisition of children. This in itself is not a problem; social scientists frequently have to rely on more or less proximal indicators of underlying concepts. Problems arise, however, when the strength of the link between the indicator and the concept of interest differs across groups that are then compared.

For instance, in some immigrant-sending countries, access to education is highly unequal. For example, poor or rural populations may have access to only the most basic public education, no matter what their intellectual potential. Also, the degree to which returns to education diminish and thus the incentives to invest in education vary substantially across countries (Psacharopoulos and Patrinos 2004). Even for those who do receive formal education, the substantive content of a year of schooling itself may differ (Fuchs and Wößmann 2007; Hanushek and Kimko 2000). Thus, the average level—and substantive meaning—of formal education may differ between national contexts. As Feliciano (2005:844) pointed out, ". . . neglecting educational selectivity, or relative educational attainment, assumes that a high school degree earned in one context (say, a country where only 10% of the population has one) has the same meaning as a high school degree earned in another context (say, where 80% of the population has one)."

Although these insights are frequently applied to questions of assimilation and cross-group comparisons, the methodological implications receive scant attention. In the

following sections, we show how variation in intergenerational transmission of educational attainment can lead to false conclusions when aggregate-level data are used to make inferences about individual transmission and when parental educational attainment serves as a "control" variable for family background characteristics, such as parental human capital.

Methodological Implications of Group-Level Variation in the Transmission of Educational Attainment

Aggregate Data and Ecological Fallacy

Earlier U.S. research on intergenerational transmission in immigrant families, as well as current research in some countries with more recent immigrant populations, has relied on aggregate data to estimate intergenerational transmission coefficients. Lacking data that links parent and child dyads, these studies have instead regressed educational or wage averages of the children of immigrants on the average of immigrants of the same ethnic origins several decades prior. Using this method, a series of highly influential articles by Borjas (1993, 1994) demonstrated that links in educational attainment and reported wages between first- and second-generation immigrants, and even between first- and third-generation immigrants, are strong and significant, suggesting strong intergenerational transmission. The work by Card and collaborators (2000, 2005), using similar methods, also found substantial links between immigrant parents and their U.S.-raised children. The studies by Card and colleagues especially are widely used as an example for similar work with alternative data sets and other countries (see, for instance, Aydemir et al. 2013:S110 and Bonikowska and Hou 2010:324 for Canada; Dustmann 2008:301 for Germany; Nielsen et al. 2003:760 for Denmark; Dustmann and Glitz 2011:299 and 2011:408 for the United Kingdom, Germany, and France; Bauer and Riphahn 2007:146 for Switzerland; Park and Myers 2010:374 and Hatton and Leigh 2011:392 for the United States).

Across a number of countries, studies using aggregate data have consistently found much higher estimates of transmission than those using comparable micro-/family-level data. At the same time, intergenerational associations are consistently lower in migrant than in nonmigrant families (Aydemir et al. 2013; Bauer and Riphahn 2006; Borjas 1992; Dustmann 2008; Gang and Zimmermann 2000; Nielsen et al. 2003; Riphahn 2003).[2] Two recent studies, an OECD review of intergenerational mobility studies by d'Addio (2007:57) and Dustmann and Glitz (2011), noted the discrepancies in different estimates but did not address the source of the differences.

It is possible to infer individual-level processes, such as intergenerational transmission, from aggregate-level regressions; however, such inference rests on strong assumptions. One way of stating the condition for accurate cross-level inference is that the relationship between variables on the individual level is the same across units of aggregation (Firebaugh 1978; Goodman 1953; Hammond 1973). In our case, this would mean that the relationship between foreign-born parental education and second-generation education does not vary across immigrant origin groups. When only

[2] A table summarizing these studies in more detail is available from the authors upon request.

aggregate data are available, this of course cannot be evaluated empirically and has to be assumed.

Another way to state the requirement formally is that for an estimate from aggregate data to be equivalent to those from individual-level data, in a (hypothetical) individual-level model, the mean of the independent variable can provide no additional information on the outcome variable. We illustrate this with a simple bivariate case: regressing the educational attainment y (measured in years) of individuals i in group j on an intercept α and the educational standing (in years) of their parents x. Using the notation in Eq. (1), the coefficient indicating the effect of the mean education level β_2 must be equal to 0 for this assumption to hold (see also Firebaugh 1978:560):

$$y_{ij} = \alpha + \beta_1 x_{ij} + \beta_2 \bar{x}_j + \varepsilon_{ij}. \quad (1)$$

Referring to the review of group-level effects described earlier, it is easy to see how this condition may be violated in models that examine the intergenerational transmission in immigrant families. In several ways, we can imagine how the mean level of parental education in a group is associated with second-generation outcomes above and beyond parental education.

Figure 1 illustrates how aggregation can cause bias. The figure uses data from two groups, Mexican- and Chinese-origin respondents, from a recent survey of the children of immigrants in Los Angeles. The regression lines based on individual data for both groups (gray for Mexicans, black for Chinese) show a relatively weak relationship between parental and second-generation education as measured in years. The coefficients are 0.13 and 0.14, respectively. Fitting a line for individuals from both groups, we get a slope of 0.24 (dashed line). Aggregating and using group means to fit a regression produces a much steeper line, with a slope coefficient of almost 0.6.

The Use of Parental Education as a Control Variable

The more recent availability of micro-level data on immigrants and their children has enabled further study of immigrant–native and national origin differences in educational outcomes as well as the mechanisms underlying these differences. Some of these studies have focused on the "immigrant effect," comparing the children of immigrants to children of natives of the same (pan)ethnicity and generally documenting better outcomes among the foreign-born and children of the foreign-born (Harris et al. 2008; Thomas 2009; Xie and Greenman 2011). Others have focused on context of reception and cultural impacts, comparing the children of immigrants of different national origins; these studies have found large differences in the educational outcomes of Asian and Hispanic immigrants, for instance, or between the children of immigrants with more positive versus more negative contexts of reception (Haller et al. 2011; Kasinitz et al. 2008; Waters et al. 2010). Finally, many authors have sought to find the specific mechanisms underlying variation in educational outcomes among the children of immigrants, employing national origins merely as controls and focusing instead on gender (Feliciano 2012), neighborhood context (Xie and Greenman 2011), or attitudes and peer school context (Greenman 2013). The majority of these authors have argued that the nativity, immigrant origin, or mechanism coefficients they observed in relationship to educational outcomes are "net of" or "controlling for" parental background,

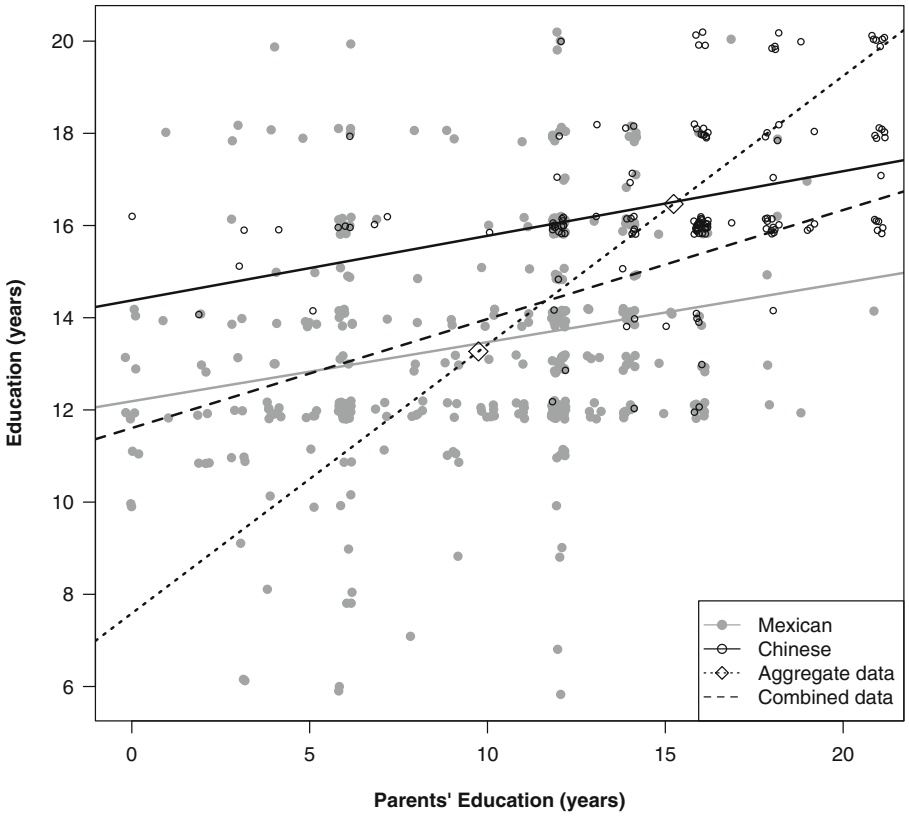

Fig. 1 Example of bias when using aggregate data to estimate inheritance of education from immigrants to the second generation using the IIMMLA data. Gray represents Mexican second-generation respondents, and black represents Chinese second generation. The dotted line indicates the estimate obtained using aggregate data, and the dashed line indicates the line obtained using the combined data

which is measured as parental education, income, and/or occupational status. Yet, with the exception of Thomas (2009), all these studies employed additive models of parental education or socioeconomic background, assuming uniform effects across different groups or allowing effects to differ only between very broad panethnic groups (Xie and Greenman 2011).

In individual-level studies of second-generation educational attainment, parental educational attainment serves as an indicator, or a "plug-in" proxy variable (see discussion in Wooldridge 2003:296) for the unmeasured set of parental characteristics that the researcher deems relevant for educational attainment. Most of these studies implicitly relied on a model of second-generation educational attainment y that recognizes the effect of a set of parental characteristics x_2^* on educational outcomes of children, alongside other variables of interest such as parental origin or ethnicity, denoted with x_1 in Eq. (2):

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2^* + \varepsilon. \tag{2}$$

The primary interest in these studies is the parameters for β_1 with x_2^* fixed: in other words, what is the difference in educational attainment across countries of origins (or

ethnic categories) *holding constant* these parental socioeconomic and human capital characteristics? However, because this set of variables is not observed (or is hard to even define exhaustively), observed variables such as parental educational attainment x_2 are "plugged in" for x_2^*.

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \varepsilon. \tag{3}$$

For x_2 to serve as a proxy, we require, first, that it has a relationship to x_2^*:

$$x_2^* = \delta_0 + \delta_2 x_2 + v_2. \tag{4}$$

If $\delta_2 = 0$, then δ_2 is not a suitable proxy. As noted earlier, there are ample reasons to believe that for some national origin groups, δ_2 may approach 0 simply because school quality is so poor or because educational opportunities are extremely rare or are allocated with little regard to merit. By definition, we are not able to demonstrate this potential problem empirically because x_2^* is unobserved.

Second, for Eq. (3) to provide consistent estimators of β_1, we must also make two assumptions about ε and v_2: (1) that error ε is uncorrelated with x_1 and x_2, the standard assumption for any regression model; and (2) that the error v_2 is uncorrelated with x_1 and x_2. In other words, we assume that when x_2 is controlled for, the expected value of x_2^* does not depend on x_1:

$$E\left(x_2^* | x_1, x_2\right) = E\left(x_2^* | x_2\right) = \delta_0 + \delta_2 x_2. \tag{5}$$

Again, following from our earlier review, because there are clear reasons to suspect that the strength of the link between x_2^* and x_2 will vary across immigrant groups, v_2 will be correlated with independent variables x_1, such as parental country of origin. Failing to control for potential differences in the educational status transmission process may therefore lead to biased estimates of other relationships of interest to migration scholars besides educational transmission.

Although "true" human capital is unobservable, we can empirically demonstrate how failing to account for variation in the strength of educational transmission leads to biased estimates of the differences in the educational attainments of different national origin groups.

Similar to the model underlying Fig. 1, we regress years of education on the highest parental education, here focusing on the children of Mexican immigrants and of native non-Hispanic whites. In Fig. 2, we present the predicted years of education from two specifications: a model that assumes a homogeneous relationship between parental education and second-generation attainment (dashed lines) and a model allowing the strength of intergenerational transmission to differ across groups.[3]

We see that the predicted years of respondent education, particularly at the highest and lowest levels of parental education, differ between the additive and interactive

[3] This model is unweighted. The difference in expected education will differ depending on weights used; because the children of native whites are a much larger percentage of the U.S. population than the children of any foreign-born group, in weighted models that also assume homogeneous educational transmission will more closely approximate the native white transmission pattern and will deviate more severely from most immigrant origin patterns.

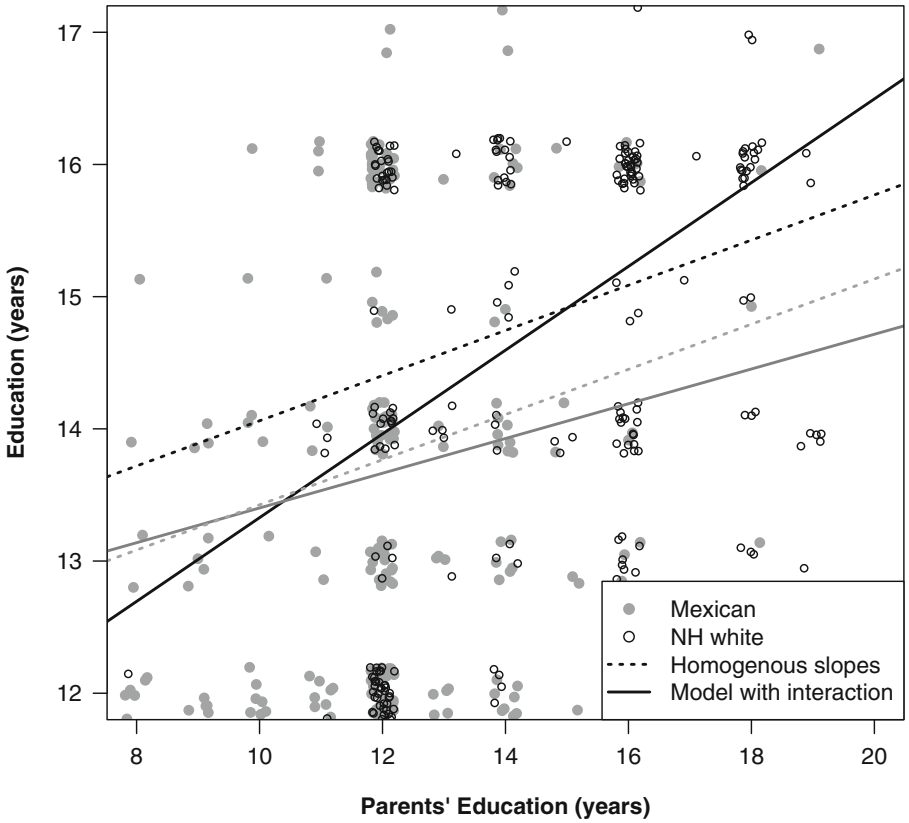

Fig. 2 Example of bias when using aggregate data to estimate inheritance of education from immigrants to the second generation using the IIMMLA data. Gray represents Mexican second-generation respondents, and black represents children of native white parents. The dashed line indicates the estimate obtained assuming homogenous slopes, and the solid lines are from a model that lets slopes vary across groups

models. For the children of native whites with only eight years of education, for instance, the difference in expected years of education is an entire year. At the other end of the spectrum, at 16 years of parental education, the difference in expected education for native-born whites is 0.14 years, and assuming homogenous slopes overestimates the attainment of the children of Mexican immigrants by one-fourth of a year. Rather than "holding all else equal," we get comparisons that are not appropriately matched, and failing to account for different levels of educational transmission makes groups appear more or less disadvantaged than they likely are. In some cases, including more socioeconomic, behavioral, and attitudinal controls might reduce this bias. Still, many of these variables will, to some degree, suffer from the same problems as educational attainment.

Analysis

We now turn to four data sets collected over the last decade that provide information on the educational attainment of second-generation adults and their parents from a variety

of national origin groups, enabling us to estimate intergenerational transmission of education using both individual-level and aggregate-level data. Three of these surveys sampled second-generation respondents in four different metropolitan areas in the United States: the Immigration and Intergenerational Mobility in Metropolitan Los Angeles (IIMMLA) survey; the Immigrant Second Generation in Metropolitan New York survey (ISGMNY); and the Children of Immigrants Longitudinal Survey (CILS), which surveyed the children of immigrants in San Diego and Miami. In addition, we rely on the National Education Longitudinal Study (NELS), which provides nationally representative samples of several national origin groups.

Data

Second-Generation Surveys: IIMMLA, ISGMNY, and CILS

These three surveys, collected specifically for the study of the children of post-1965 immigrants, all provide extensive information on respondents' educational trajectory as well as the educational background of their parents. Although these surveys have the disadvantage of not being nationally representative, they employ quota sampling and thus provide sufficient samples for national origin groups that a nationally representative sample could not capture.

- ISGMNY, conducted in 1998 and 1999, entailed a telephone survey, interviewing 3,415 young adults, aged 18 to 32 in New York City and its surrounding suburbs. The survey targeted second-generation Chinese, Dominicans, Russian Jews, West Indians, and Central Americans from Colombia, Ecuador, and Peru. It also includes comparison groups of native blacks, Puerto Ricans, and non-Hispanic whites.
- Also a telephone survey, IIMMLA was conducted in 2004 and collected approximately 4,500 interviews with young adults aged 20 to 39 in the Los Angeles metropolitan area, comprising Los Angeles, Orange, Ventura, Riverside, and San Bernardino counties. The sample has quotas for second- and 1.5-generation groups (Mexicans, Vietnamese, Filipinos, Koreans, Chinese, and Central Americans from Guatemala and El Salvador) and includes three native-parentage comparison groups composed of third- and later-generation Mexican-Americans, non-Hispanic whites, and blacks.
- CILS involved a longitudinal survey of immigrant offspring living in San Diego (California) and Miami/Ft. Lauderdale (Florida). The original survey was conducted in 1992, with samples of second-generation children attending the eighth and ninth grades in public and private schools in the metropolitan areas of Miami/Ft. Lauderdale and San Diego. The students were sampled again in 1995–1996, and finally in 2001–2003. Because we are interested in the final educational attainment, we use Wave 3 of the data, which provides 3,334 respondents. In Wave 2, CILS also asked about parental education and directly interviewed the parents of approximately one-half of the original respondents. We use this additional information in supplementary analyses to assess the impact of error in children's reports of parental education on our estimates.

National Education Longitudinal Study (NELS)

During the spring term of the 1987–1988 school year, the National Center for Education Statistics (NCES) initiated a nationally representative longitudinal study of 8th grade students attending 1,052 high schools across the United States. We restrict our analysis to the fourth wave collected in 2000, which interviewed 12,144 young adults.

To make our work comparable to previous research and to reduce issues of censoring, we use only respondents of an age when most will have finished their educational careers. For IIMMLA, ISGMNY and NELS, we restrict our samples to respondents ages 25 and older. Because the CILS surveyed a younger population, we have to use a lower cutoff and have a sample between ages 23 and 25. We further control for age at time of survey. We define the second generation as children who have at least one foreign-born parent and who were born in the United States or arrived before starting primary school (less than 5 years old).[4]

Variables

National Origin

For IIMMLA, CILS, and the ISGMNY, we code national origin as respondent's place of birth. When the respondent was born in the United States, we use mother's place of birth; where this is missing or in the United States, we use father's birthplace. NELS does not provide detailed information on parent's place of birth. For this survey, we use respondent's reported ethnic origin. We include groups with at least 30 valid observations in the analysis.

Respondent's Years of Education

The data available on respondents years of education differ across the surveys: IIMMLA data contain greater detail on grade level and time spent in college, and provide a variable that maps this information into years of education (ranging from 6 to 20 years). ISGMNY contains less detail about early schooling; we code the lowest educational category (some grade school) at 6 years of education. CILS data were collected in schools during early adolescence and thus are left-censored at 10 years of schooling; the cutoff for NELS data is 9 years. All data have 20 years of education as the highest category.

Parental Years of Education

For ISGMNY and IIMMLA, we coded parental education using the same coding routine as described earlier for the respondents. The IIMMLA included a small number of parents with no formal schooling, which we coded as 0 years of education. CILS provides only categorical measures of educational attainment for respondent's parents,

[4] Our results are robust to using a more restrictive definition that includes only U.S.-born children of two foreign-born parents.

with the lowest level at elementary school or less (coded as 6 years of education) and the highest level at college graduate or more (coded 16). Similarly, NELS provides categorical measures of parental education that begin at "did not finish high school" (coded 10). The highest level of education, "Ph.D., M.D. etc.," is coded as 20 years of education.

We code the number of years of formal education both the respondent's mother and the father received and then define parental education as the highest of the two. Our results are substantively robust to using either father's or mother's education as the independent variable.

Results

We first summarize and describe the distributions of parental and respondent's education data for each national origin group sampled. We present means and variances. We then calculate changes in these parameters between parents and children as well as the regression coefficient of respondents on parents' education. This information is summarized in Table 1.

We see that for the majority of the immigrant groups, the children have a higher average education than their parents and that their distributions are far more compressed. Thus, not only do the children of immigrants have higher educational attainment than their parents, but there is also less within-group inequality in the second generation.

The last two columns of Table 1 show the estimated slope coefficients and standard errors from a linear regression of respondents' education on parental education measured in years, controlling for age. The slopes vary significantly across groups, ranging from being statistically not different from 0 to a maximum of 0.41. Thus, a key assumption of both aggregate regression and human capital controls—that the relationship between parental and respondent education is equal across groups—is not satisfied. More specifically, we see that among immigrant groups, with the exception of Filipinos, Colombians, and Indians, the effect of parental education is substantially smaller than for whites with native parents where the regression coefficient ranges from 0.28 (NELS) to 0.31 (IIMMLA) to as high as 0.41 in the ISGMNY data—coefficients of the same magnitude as the ones quoted by Card and colleagues (2000, 2005). Among native blacks, the influence of parental education is similar: 0.28 in the ISGMNY data but a bit lower in the NELS and IIMM LA data. Only among the children of native-born Puerto Ricans in our New York (ISGMNY) data is parental influence as low as that observed among the children of immigrants. This may be a consequence of the particular sample of Puerto Ricans in the ISGMNY, who are more likely to live in the same ethnic enclaves as the foreign-born and thus are subject to similar transmission processes as immigrants.

In contrast, for native-born (third- and later-generation) families with Mexican ancestry in the Los Angeles area, the effect of parental education on respondent's education is 0.39, significantly higher than the coefficients observed amongst the second-generation groups. Given that third- and later-generation Mexican-origin families are more likely to disperse into majority Anglo neighborhoods than Puerto Ricans

Table 1 Educational attainment as measured in years of respondents, their parents, and intergenerational change by national origin group and survey source in analysis

	Parents			Respondents			Change Across Generations		Regression	
	Mean	Var.	*N*	Mean	Var.	*N*	Mean	Var.	Beta	SE
IIMMLA: Mexican (MX)	9.7	18.3	399	13.3	5.7	462	3.5	–12.6	**0.13**	**0.03**
Salvadoran (SV)	11.7	15.5	82	14.1	3.6	94	2.3	–11.8	0.03	0.05
Guatemalan (GT)	11.4	17.4	52	14.0	3.9	58	2.6	–13.5	–0.06	0.06
Chinese (CN)	15.2	18.0	145	16.5	3.2	152	1.2	–14.7	**0.15**	**0.03**
Korean (KR)	15.3	9.8	162	16.1	4.0	169	0.8	–5.8	0.05	0.05
Vietnamese (VN)	13.4	15.5	107	15.8	3.6	117	2.4	–11.9	0.09	0.05
Filipino (PH)	15.7	5.0	187	15.5	3.4	189	–0.2	–1.6	**0.29**	**0.06**
ISGMNY: China (CN)	13.1	19.2	86	16.0	2.8	90	2.9	–16.4	**0.14**	**0.04**
Colombian (CO)	13.4	8.4	37	14.6	3.2	39	1.2	–5.2	0.19	0.09
Dominican (DO)	11.6	13.3	114	14.2	5.2	122	2.5	–8.2	0.10	0.05
Ecuadorian (EC)	12.5	11.6	57	13.8	4.0	59	1.3	–7.7	**0.19**	**0.07**
Jamaican (JM)	13.9	4.5	32	14.9	3.3	34	1.0	–1.2	0.06	0.15
Puerto Rican (PR)	11.7	8.8	137	13.1	5.6	146	1.4	–3.2	0.02	0.07
CILS: Laotian (LA)	10.7	15.4	37	13.6	3.0	40	2.9	–12.5	–0.08	0.07
Filipino (PH)	14.9	2.2	320	14.6	2.4	309	–0.3	0.2	**0.33**	**0.06**
Thai (TH)	8.1	16.2	32	13.2	2.4	35	5.1	–13.8	0.03	0.08
Vietnamese (VN)	11.4	12.7	88	14.8	3.2	88	3.5	–9.5	**0.11**	**0.05**
Mexican (MX)	10.4	12.3	259	13.4	3.0	251	3.0	–9.3	0.05	0.03
Cuban (CU)	13.2	6.5	524	14.4	3.5	521	1.2	–3.0	**0.19**	**0.03**
Dominican (DO)	12.9	11.2	37	13.7	3.5	37	0.7	–7.7	**0.19**	**0.09**
Haitian (HT)	12.1	10.8	46	14.5	1.8	48	2.4	–9.0	–0.03	0.06
Jamaica (JM)	14.3	4.7	44	15.2	3.4	46	0.9	–1.3	0.23	0.12

Table 1 (continued)

	Parents			Respondents			Change Across Generations		Regression	
	Mean	Var.	*N*	Mean	Var.	*N*	Mean	Var.	Beta	SE
Nicaraguan (NI)	13.9	8.3	74	14.3	3.2	73	0.4	–5.1	**0.15**	**0.07**
Colombian (CO)	13.5	4.5	71	14.3	3.4	72	0.8	–1.2	**0.34**	**0.10**
NELS: Mexican (MX)	11.6	4.6	326	13.3	2.1	375	1.8	–2.5	**0.09**	**0.04**
Cuban (CU)	15.0	9.0	35	14.6	3.8	39	–0.3	–5.3	0.06	0.11
Puerto Rico (PR)	12.9	7.3	73	13.4	1.7	79	0.5	–5.6	0.06	0.05
Indian (IN)	18.2	4.2	48	16.3	2.4	50	–1.9	–1.9	**0.30**	**0.10**
Chinese (CN)	15.6	11.6	96	15.6	2.4	108	0	–9.1	0.07	0.05
Filipino (PH)	15.6	6.3	49	15.0	4.1	55	–0.6	–2.2	**0.37**	**0.11**
Korean (KR)	16.1	8.7	60	15.3	2.9	65	–0.8	–5.9	**0.24**	**0.07**
Comparison Groups With Native Parents										
NH white (NHW): NELS	14.3	7.4	6,477	14.2	3.4	6,797	–0.2	–4.0	**0.28**	**0.01**
ISGMNY	15.3	8.2	246	15.5	5.8	249	0.1	–2.4	**0.41**	**0.05**
IIMMLA	15.0	7.6	309	14.8	5.2	318	–0.2	–2.4	**0.31**	**0.04**
NH black (BLK): ISGMNY	13.7	6.9	229	13.5	4.6	249	–0.2	–2.3	**0.28**	**0.05**
NELS	13.7	6.3	714	13.6	2.8	779	0	–3.6	**0.16**	**0.02**
IIMMLA	14.0	6.5	294	13.8	3.7	312	–0.1	–2.7	**0.22**	**0.04**
Mexican 3rd gen. (MX3): IIMMLA	12.9	4.9	271	13.4	4.2	289	0.5	–0.7	**0.39**	**0.05**
Puerto Rican (PR3): ISGMNY	12.4	5.9	50	13.2	5.5	53	0.7	–0.4	0.13	0.14

Notes: Regression coefficients are adjusted for age. Coefficients that are significant at the .05 level or higher are in bold.

or Cubans (South et al. 2005), generation status may be a stronger indicator for community-level influences on the association in education among those of Mexican origin.

Model 1 in Table 2 replicates previous aggregate analyses. We average our measures of education and age by origin group and then use these aggregate data to regress respondent's education on parental education. The slope coefficient of this regression is 0.35, and after we weight each national origin group to represent their proportion of the U.S. foreign-born population as of 2000 (Model 1b), we obtain a regression coefficient of 0.43. These are coefficients of the same magnitude as the one found by Card et al. (2000) and Card (2005), using the same methodology.[5] They are also significantly higher than *almost all* the estimates of intergenerational transmission within groups in Table 1.

Model 2 uses the individual-level data for all immigrant groups from all four surveys, weighted for their representation among the foreign-born, thus giving an average of the effect of parental education in immigrant families. This model also includes dummy variables for each national origin to net out differences in average education levels of groups. The slope estimate for the effect of the transmission of parental educational attainment is 0.11, which is significantly lower than the 0.3 to 0.4 estimated for nonmigrant families.

Model 3 again uses pooled individual-level data for all immigrant groups from all surveys, weighted for their representation among the foreign-born, but does not include fixed effects for national origin. Even in this specification, the transmission rate remains low at only 0.17.[6]

Finally, in Model 4, we replicate Borjas (1992) and estimate a random-effects generalized least squares model including individual information on parental education as well as the mean parental education of each group—in effect, estimating Eq. (1) from earlier and disaggregating the individual- and group-level effects. As expected, the effect of average education in the group β_2 is not 0 (or negligible) as would be required for reliable inference with group-level data, but in fact is larger than the effect of parental attainment by a factor of about 2. Taken together, these two coefficients add up to the aggregate-data estimate obtained in Model 1.

Variation in Intergenerational Transmission of Education

Although immigrants in general have much lower rates of intergenerational transmission than natives, there is considerable variation in the strength of intergenerational transmission by national origins. To examine this variation, Fig. 3 plots the regression coefficients in Table 1 against the mean parental education and the dispersion of parental education in each group. Mean parental education and the dispersion of parental education of the origin group in the United States serve here as indicators of the coethnic community and sending country allocation of education, which are two

[5] Replicating regressions using the mean level of education of adults from the same origin group at the metropolitan level from the census gives similar results: .31 unweighted and .51 weighted.
[6] Coefficients obtained without weights are 0.12 for Model 2 and 0.19 for Model 3.

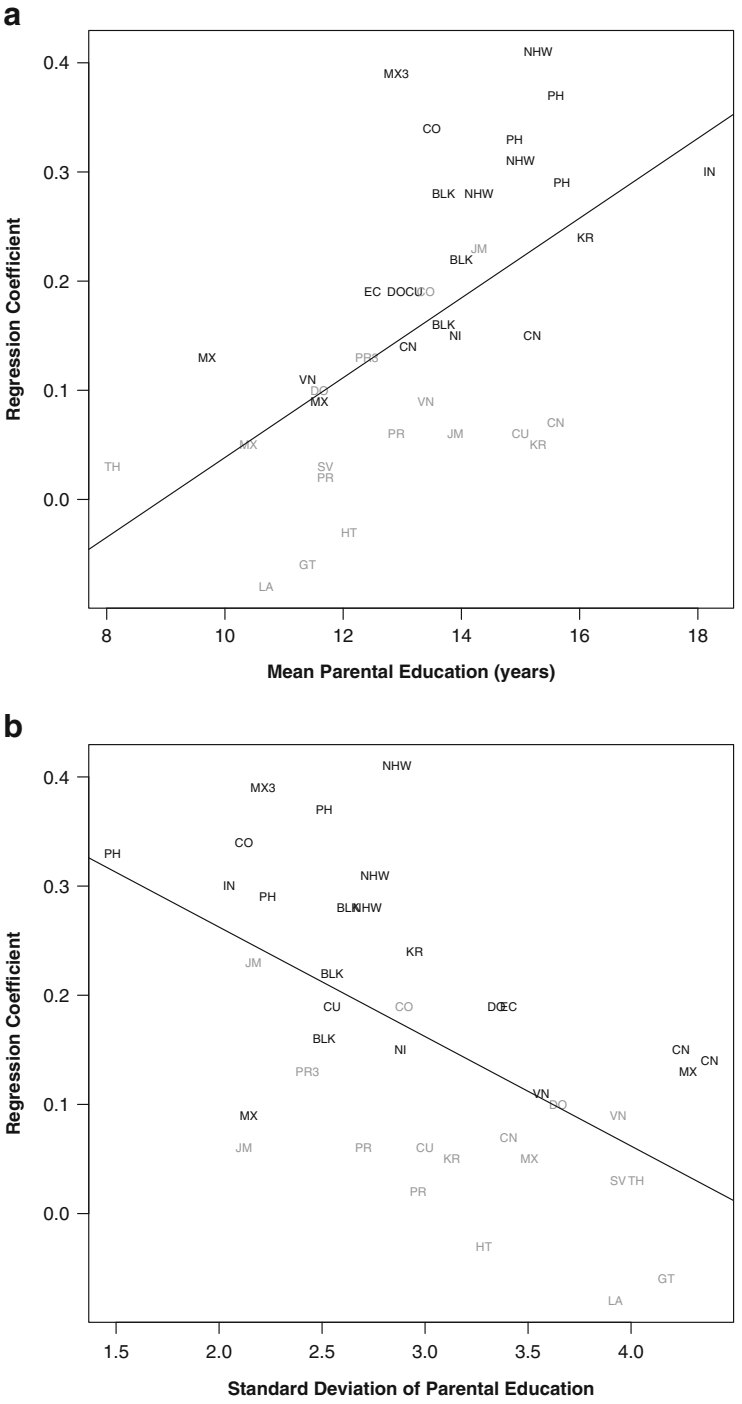

Fig. 3 Regression coefficient of intergenerational transmission by national origin group plotted against mean education of parents (upper panel) and the standard deviation of parental education (lower panel). Coefficients that are not statistically significant at the .05 level are plotted in gray. Abbreviations and country names are listed in Table 1. The slopes of the regression lines are 0.04 and –0.1, respectively. R^2 is .34 in both regressions

Table 2 Models estimating intergenerational transmission of education in immigrant families pooling IIMMLA, ISGMNY, CILS, and NELS data

	Model 1			Model 1b			Model 2			Model 3			Model 4		
	Coef.	SE	*t*	Coef.	SE	*t*	Coef.	SE	*t*	Coef.	SE	*t*	Coef.	SE	*z*
Intercept	8.65	1.63	5.32	6.40	1.95	3.28	11.24	0.48	23.50	10.96	0.24	45.75	8.87	0.84	10.61
Mean of Parental Education	0.35	0.06	5.52	0.43	0.05	8.53							0.22	0.06	3.53
Parental Education							0.11	0.01	11.67	0.17	0.01	20.14	0.12	0.01	12.44
Age	0.05	0.06	0.96	0.10	0.07	1.44	0.03	0.01	3.71	0.03	0.01	4.15	0.05	0.01	6.21
National Origin Index							Yes			No					
Weighted to U.S. Population	No			Yes			Yes			Yes			No		
N	18			18			3,753			3,753			3,753		
Clusters													18		
Sigma U													0.50		
Sigma E													1.83		
Rho													0.07		

variables that may determine the relative importance of individual transmission and group-level effects.

As the graphs in the figure show, in groups with higher average educational attainment among the immigrant parents, the parent–child association in education is significantly stronger than in groups with low average attainment. In contrast, higher within-group variation in education is associated with weaker parent–child association.

These associations point to a number of mechanisms. First, for immigrants from countries with poor quality (as indicated by low mean) and unequal (as indicated by larger standard deviation) education systems, parental education will be a relatively worse indicator of the family characteristics that matter for the educational attainment of the second generation.

Second, members of national origin groups with higher average education will rely less on community-level resources (ethnic capital) and are less likely to live in distinct neighborhoods where national origin overlaps with peer characteristics and the availability of extrafamilial educational support systems. In addition, any ethnic social capital will be most effective when human capital differs significantly within the group: for instance, in the case of the Chinese in New York (Kasinitz et al. 2008) or the Vietnamese in New Orleans (Zhou and Bankston 1994).

Measurement Error and Other Caveats

One possible objection to this analysis may be the issue of measurement error. As Borjas (1992) discussed, measurement error in parental education (because of recall error, for example) may increase the estimate of the effect of mean education of the group β_2. Acting as an instrument, mean parental education may capture some of the "lost" individual-level effects.

Using a subset of our data, we directly address this issue. CILS asked second-generation respondents in Waves 1 and 2 about parental education and included a parental questionnaire for a subset of the sample. Although highly correlated (.77), responses are not perfectly consistent. To assess the extent to which this measurement error may attenuate the coefficients for intergenerational transmission and inflate "group effects," we use all three measures of parental education as indicators of a latent variable that enters the regression equation for educational outcomes along with a vector of the origin group means. Thus, we take the "true" educational attainment of a parent as a latent variable η_i measured by a vector of observed indicators $\mathbf{x}_i$. In our case, $\mathbf{x}_i$ has length 3, combining the respondents' answers about their parents' education in Wave 1 and Wave 2 as well as the parental questionnaire where available. Factor loadings λ and intercepts τ relate these indicators to our unmeasured variable *parental education*, leaving residuals ζ_i. This measurement model can be written as

$$\mathbf{x}_i = \tau + \lambda\eta_i + \zeta_i. \tag{6}$$

In conjunction with Eq. (1), this gives us a regression coefficient for family-level transmission of education that is not attenuated by measurement error.

Table 3 summarizes the results. For comparison, we include regression models analog to those in Model 4 from Table 2. Using measures of fathers' education, we see that the latent variable estimate of parental transmission is indeed somewhat higher compared with the regression estimates, and the effect of national origin education is a

Table 3 Models using various different measurements of parental education available in the CILS data

	Regression					
	Using Wave 1		Using Wave 2		Latent Variable Model	
	Coef.	*z*	Coef.	*z*	Coef.	*z*
Father's Education	0.09	5.78	0.09	5.47	0.12	4.32
Mean of Father's Education	0.2	1.89	0.16	1.67	0.14	1.81
N	1,312		1,289		1,559	
Mother's Education	0.13	8.06	0.11	7.00	0.16	4.18
Mean of Mother's Education	0.12	1.61	0.09	1.31	0.04	0.42
N	1,383		1,340		1,559	

Notes: The regression models are estimated analog to Model 3 in Table 3. All standard errors are adjusted for clustering. The latent variable model is estimated using a robust maximum likelihood estimator and shows excellent fit to the data: CFI > 0.99, and RMSEA < 0.05.

bit lower. In the case of mothers' education, we see a similar pattern in the estimate of the parental transmission, but the "group effect" does not reach statistical significance in either the regression or the latent variable models. We conclude that measurement error does introduce some upward bias on the estimated effect of characteristics of the national origin groups and some downward bias on the estimate of family-level transmission. However, the magnitude of this bias is not large enough to substantively alter the conclusions of our analysis.

Finally, we want to briefly address three other caveats. First, the majority of our data come from metropolitan areas with large numbers of immigrants residing in ethnic neighborhoods. Our article therefore best represents the experiences of immigrants and their children in traditional gateway cities. However, traditional metropolitan destinations still reflect the experience of the majority of the immigrants in the United States: according to the U.S. census in 2010, 85 % lived in the 100 largest metropolitan areas. To further assess whether a national-level sample would differ, we replicated all the earlier analyses using only the NELS national-level data, applying survey weights for national representativeness. The substantive finding remained the same: the effect of average group education level (0.33, for 10 groups) was much larger than the effect of individual-level parental education (0.19).

Second, there is some discrepancy in the characteristics of immigrant national origin groups across surveys. For instance, estimates of intergenerational transmission among Mexicans in the IIMMLA and NELS survey are higher and are statistically significant, whereas estimates from CILS data are lower and not statistically significant at conventional levels. Many differences between each survey could account for these differences, including the sampling at different ages (youth in NELS and CILS, and adults in IIMMLA and ISGMNY) as well as differences between metropolitan areas and national averages. Ultimately, we cannot pin down the cause for these differences, and we take comfort in the estimates being *substantively* consistent: for instance, Filipinos consistently have the highest levels of intergenerational transmission, whereas most of the groups show estimates that are below 0.2.

Finally, with the expansion of higher education systems in various migrant-sending countries in recent decades, we might expect that the intergenerational transmission of education among children of immigrants from countries with lower average educational attainment to be stronger among more recent cohorts of immigrants. Documenting such changes may be a fruitful avenue for further research.

Discussion

This article demonstrates that intergenerational transmission of education is weaker within immigrant families than in native families and that the strength of the transmission differs between immigrants of different national origins. The existence of significant group-level effects on the educational transmission process violates the uniformity assumption underpinning the use of both aggregate data and parental background "controls" in studies of immigrant intergenerational change.

Estimates based on aggregate data subsume both group-level effects as well as individual-level transmission processes. Yet, contemporary theories of assimilation highlight the analytical distinction between individual-level (or family-level) processes on the one hand and national origin differences in ethnic resources and immigrant contexts of reception ("group-level effects") on the other. Thus the "cross-level inference problem" relates to the conceptual distinction between individuals and ethnic categories in social science analysis. As the broader literature on race, ethnicity, and nationalism shows, ethnicity and group-level processes certainly play a role in life chances, but ethnic groups are not the building blocks of society and cannot be the units of coherent social science analysis (Brubaker 2004).

Our analysis suggests that the relationship between formal education and the socioeconomic and human capital traits that encourage children's academic attainment varies across immigrant groups and, quite systematically, between immigrants and natives. Immigrants and natives are educated in fundamentally different education systems and therefore—from the point of view of education as a selection mechanism or a sorting by abilities—have educations that are not commensurate. Thus "controlling for education" (or for parental education) may be a statistical exercise of dubious value in analyses that compare immigrants of different origins or immigrants and the U.S.-born.

Our article has two concrete implications. First, individual-level data are necessary for the measurement of intergenerational continuity in socioeconomic characteristics in immigrant families and especially for comparisons across time and between different immigrant origin groups and the native-born. Second, our article cautions against the common practice to "control for education" in analyses that contain immigrant and natives as a way of taking human capital into account or to control for parental education in analyses of the second generation and natives as a way of controlling for the human capital of parents. Fortunately, the most recent data on U.S. immigrant families (such as those used in this article) now enable researchers to include additional controls for the aptitudes, values, and resources hypothesized to drive the different transmission rates across ethnic groups. Beyond the United States, a promising new line of research posits using measures of "relative educational attainments," or the educational position of the immigrant in the distribution of the country of origin (Ichou

2014), as a more universal control for parental background when making adjusted comparisons of second-generation outcomes.

This study also establishes that national origin average educational level and dispersion moderate the intergenerational transmission process. We show that the strength of the correlation between immigrant parent and child is positively related to the average level of education and inversely related to the educational variance of the immigrant origin group. We interpret this finding as evidence that among the more highly educated and educationally homogeneous immigrant origin groups, who are less likely to live in ethnic enclaves and rely on ethnic resources, extrafamilial influences will play a smaller role.

Indeed, this interpretation aligns with what we know about immigrants with the largest intergenerational coefficients: those of Indian and Filipino origin. Both migration streams are dominated by middle-class professionals, educated in formerly colonialized English language schooling systems, the former displaying strong cultural and linguistic ties with the United Kingdom and the United States and the latter the largest former U.S.-colonized immigrant group in the United States (Cheng and Yang 1998; Le Espiritu 2003). These groups arrive with high levels of human capital, linguistic acculturation, and formal legal status. Their rapid socioeconomic absorption into the "middle-class mainstream" creates patterns of intergenerational transmission similar to that of native whites. On the other hand, the Vietnamese, Korean, and Chinese origin groups with very low intergenerational transmission rates reside in strong ethnic enclaves that promote high rates of upward intergenerational mobility among even the most disadvantaged members.

On average, and especially in migrant streams with low levels of education, parental education is much less predictive of the educational outcomes of the second generation than estimates based on aggregate data suggest. On the one hand, this bodes well for the long-term impacts of low-educated immigration streams on inequality in the United States. On the other hand, a variety of extrafamilial influences still create ethnically stratified outcomes in second-generation educational attainment. Current research that focuses on the sources of group-level heterogeneity in intergenerational mobility (Luthra and Waldinger 2013), as well as within-group variation in the relative strength of family- versus group-level effects (Alba et al. 2014), should enable the further development of theory in this area.

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