HHS Public Access

Author manuscript

Soc Sci Res. Author manuscript; available in PMC 2022 November 01.

Published in final edited form as:

Soc Sci Res. 2021 November ; 100: 102601. doi:10.1016/j.ssresearch.2021.102601.

Parental STEM credentials and children's schooling progress in immigrant and U.S. born families

Kevin J.A. Thomas,

Department of African and African Diaspora Studies, University of Texas at Austin, Austin, TX 78712

Cheyenne Lonobile

Department of Sociology, The Pennsylvania State University, University Park, PA 16801

Abstract

Although many previous studies have examined the outcomes of STEM graduates, there is very limited research examining the educational attainment of their children. Given the increasing contribution of immigration to the supply of STEM graduates, we use data from the ACS to examine disparities in children's schooling progress in the families of immigrant and U.S born STEM graduates. Our analysis shows several findings. First, the children of STEM graduates are less likely to fall behind in school than the children of graduates in Business, Arts/Humanities, and other fields of study. This relative STEM advantage is, however, stronger in immigrant than U.S born families. Second, the children of immigrant STEM graduates have more favorable outcomes than the children of U.S. born STEM graduates; however, the favorable outcomes of the former are more consistent for children whose parents have U.S. rather than foreign STEM degrees. Finally, our results show that it is only among the children of STEM graduates that we find lower odds of schooling progress among 1.75- compared to second-generation children. These odds are

kjthomas@austin.utexas.edu .

[1]This measure based on the face that children in the U.S. are generally required to enter the first grade before age 7 (Angrist and Krueger 1992, Stypek 2003).

[2]Information on field of study in the ACS applies to those reported by individuals with bachelors degrees. However, research suggests that only between 10% and 25% of STEM undergrad students change their majors when they get to graduate school (Grandy 1992; Pennock Román, 1999). Even though no information on graduate field of study is available, the analysis further includes controls for whether parents have graduate degrees to account for the independent effects of parental educational attainment that are observed over and beyond the influence of our measures of parental fields of study.

[3].Some organizations such as the National Science Foundation include the social sciences as part of STEM, while others such as the US Departments of Commerce and Homeland Security do not. Following other studies (e.g., Beede et al. 2011), our definition of STEM includes what are typically referred to as 'core STEM' fields, which excludes the social sciences. However, we create a separate category for the social sciences in the analysis. In general, our strategy is also consistent with the classification of STEM fields used by U.S. Immigration and Customs Enforcement (ICE) (2016), which regulates the immigration of foreign STEM graduates.

[4]Children of STEM graduates in immigrant families thus have at least one immigrant parent with a STEM degree.

[5]Our findings remained robust when this association was examined using random and mixed effects models. These results are available on request. We chose to report results from the logistic regression models because logistic regression models better facilitate the use of Wald tests to determine the consistency of our estimated effects between models.

statistically significant, implying that there is some convergence in the outcomes of first- and second-generation children of immigrant STEM graduates.

Introduction

Considerable progress has been achieved in recent research examining the implications of investment in Science, Technology, Engineering, and Mathematics (STEM) (Bottia et al. 2015; Bybee 2010; Zeidler 2016). Based on this body of work, we now know that STEM education promotes innovation, increases problem-solving skills, and prepares the U.S. to compete in the global economy (Atkinson and Mayo 2010; Bybee 2010; Kanematsu and Barry 2016; National Academy of Sciences 2007). Many of these contributions are dependent on demographic processes that affect the availability of STEM graduates (Eng 2013). Of these processes, international migration is perhaps the most critical for meeting the short-term demand for these graduates (Eng 2013; Grigoleit-Richter 2017; Gesing and Glass 2019). Estimates indicate that between 2008 and 2016 the number of foreign students graduating and working in the STEM fields in the U.S. increased by more than 400% (Ruiz and Budiman 2018). Not surprisingly, these trends have been accompanied by significant increases in research examining the integration of foreign-born STEM workers into the U.S. economy (Cai and Winters 2017; Lowell 2010; U.S. Department of Commerce 2016). Despite these increases, however, very little is known about the ways in which parental STEM education among immigrants can affect the outcomes of their children.

Families provide the most useful context within which these dynamics can be examined. However, the task of understanding the mechanisms through which the advantages of STEM education are transmitted from parents to children is complicated. For one, it remains unclear whether the families of STEM graduates provide peculiar advantages for their children that are lacking in other family contexts. Although evidence indicates that human-capital is easily transmitted from parents to their children (Mogstad 2017), the question of whether the strength of these transmissions vary depending on qualitative differences in educational credentials remains unanswered. Additional complications are involved in examining the degree to which these transmissions influence children's educational attainment in immigrant families. For example, assessments of educational differences between children in immigrant and U.S. native families have produced mixed evidence on whether those in the former are more disadvantaged compared to the latter (Harris et al. 2008; Hirschman 2001). Racial and ethnic inequalities among immigrants also create additional complications. As such, it is not known whether the assumed advantages associated with parental STEM education (Museus et al. 2011) are equally experienced by all immigrant families.

In this study, we attempt to bridge these gaps in the literature by investigating the relationship between parental STEM education and children's schooling progress in immigrant and U.S. born families. Using data from the American Community Survey (ACS), our analysis addresses three research questions. First, do the children of STEM graduates have a lower risk of falling behind in school compared to the children of non-STEM graduates? Second, to what extent are the children of immigrant STEM graduates

more or less likely to fall behind in school compared to the children of STEM graduates in U.S. born families? Third, what are the implications of parental STEM education for intergenerational disparities in schooling progress among the children of immigrants, and to what extent are these implications associated with differences in race? In the process of answering these questions, we hope to develop a useful portrait illustrating the various ways in which parental STEM education can shape the educational outcomes of children.

Background

Parents with STEM and Non-STEM degrees

Extant studies provide undisputed evidence confirming that there is a positive relationship between parents' educational attainment and the educational achievement of their children (Mogstad 2017; Sonnert 2009). However, there is limited systematic research on whether the influence of parents differs among those with STEM versus non-STEM degrees. Social learning theory, which indicates that parents differ in their ability to serve as role models (Chlosta et al. 2012; Dryler 1998), provides a useful starting point for understanding such differences. One way in which this role modeling influence is typically observed is in similarities in the career pathways of parents and their children. Engineers and medical practitioners, for example, have been found to be disproportionately more likely to have children who end up in similar occupations (Boussiakou and Kalkani 2007; Dorie et al. 2014). This potential for a reproduction of STEM career pathways *within* families can have critical implications for *between* family differences in children's academic performance.

Part of this stems from the fact that the pursuit of STEM education is associated with low dropout rates, higher ACT scores, and a higher likelihood of progressing from secondary to post-secondary education (Plasman and Gottfried 2016; Whalen and Shelley 2010). Parents with STEM degree may thus be better able, compared to their peers with non-STEM degrees, to draw from their own experiences to positively influence the academic preparation of their children (Blackwell and Pinder 2014; Ing 2013).

Research further indicates that the children of STEM graduates are usually exposed to STEM fields at an earlier age, and that this positively influences their likelihood of obtaining post-secondary education (Astin and Astin 1992; Grandy 1994; Ma 2013). Parental motivation in the form of explaining the value of STEM education to children in the early schooling years has also been found to be positively associated with academic performance (Rozek et al. 2017). To be clear, the respective influence of parental motivation associated with graduates with non-STEM degrees remains unknown. However, the totality of the evidence presented in previous studies implies that parents with STEM degrees are better positioned to have a positive influence on their children's educational achievement than parents with other types of credentials. Social learning theory therefore suggests that the children of STEM graduates would be less likely to fall behind in school compared to the children of non-STEM graduates.

Besides the influence of social learning, educational attainment disparities between the children of STEM and non-STEM graduates could also be influenced by differential access to socioeconomic resources. In fact, there is a wealth of evidence suggesting that the

availability of familial socioeconomic resources varies based on differences in parental fields of study. For example, STEM graduates earn incomes that are 30 percent higher than those of non-STEM graduates (Batalova et al. 2016). Indeed, many STEM graduates are recruited through specialized immigration programs for highly skilled immigrants that have been linked to higher wages. In the U.S., for example, immigrants with H1B visas have been found to have higher wages compared to workers who are U.S. citizens (Mithas and Lucas, 2010). Similarly, research in Canada indicates that among immigrants recruited through the points system, wages increase by about 2.5% for each increase in points (Sweetman and Warman, 2013). All told, the expected income advantage of highly skilled STEM graduates has an important implication. It suggests that they may be better able to provide their families with access to the types of financial resources known to positively affect children's educational attainment (Perreira, Harris, and Lee 2006). Beyond these earnings differences, STEM graduates have also been found to have lower rates of unemployment compared to non-STEM graduates (Langdon et al. 2011; Noonan 2017). As a result, their children are comparatively less likely to be exposed to the negative effects of parental unemployment on schooling compared to the children of non-STEM graduates (Coelli 2011).

Immigrant and native-born differences children schooling

Despite recent increases in research on educational disparities between the children of immigrants and natives (e.g, Kao and Tienda 1995; Hirschman 2001), we know very little about whether the specific outcomes of the children of immigrant STEM graduates differ from those of the children of native-born STEM graduates. Existing studies further provide conflicting expectations on what these educational differences might be. Research, for example, indicates that the children of immigrants have higher levels of educational attainment compared to the children of non-immigrants (e.g., Harris et al. 2008). Indeed, some studies draw from social learning theory to suggest that these differences by arguing that the positive influence of parental role modelling is higher in immigrant than in U.S. born families (Raleigh and Kao 2010; Kao and Tienda 1995). On the contrary, there is also evidence showing that some children of immigrants face significant obstacles to their educational attainment that put them at an educational disadvantage compared to the children of natives (e.g., Takanishi and Menestrel 2017).

When the children of immigrants have been shown to have comparatively lower levels of educational attainment, the explanation most often given to account for this disparity is that associated with racial and ethnic minority status (Drake 2017; Hirschman 2001; Ho and Kao 2018). Although there are few exceptions (e.g., Ogbu and Davis 2003; Ogbu and Simons 1998), existing studies indicate that racial barriers such as exposure to racial discrimination have particularly deleterious consequences for the educational achievement of immigrant children who are Black, Hispanic, or from other ethno-racial groups (Drake 2017; Pivnick 2019). Corresponding studies on whether these barriers affect the achievement of the children of immigrant STEM graduates are largely missing from the literature.

Nevertheless, there are at least two mechanisms that could potentially shape the educational attainment patterns of these children. The first is associated with the limited transferability of foreign credentials among highly educated immigrants. While immigrants with U.S.

college credentials typically do well in the labor market, those with credentials obtained from other countries typically have worse outcomes (Mattoo et al. 2008; Tong 2010), which could negatively affect the resources available to their families. In other words, immigrant STEM graduates with credentials obtained from other countries may be less likely to have the favorable income and employment outcomes typically associated with STEM education. As a result, their children may have less access to the socioeconomic resources needed to improve their educational attainment, which could increase their risk of falling behind in school.

The second mechanism is associated with immigrant assimilation processes. Although mainstream assimilation theory indicates that the outcomes of the children of immigrants improve as their generational status increases (Gordon 1964; Warner and Srole 1965), more recent studies disagree with this view. In rejecting the mainstream argument, proponents of segmented assimilation theory argue that the non-White phenotypical characteristics of immigrants from racial minority groups expose them to prejudices that increase their risk of experiencing a second-generation decline (Portes et. al 2005; Portes and Zhou 1993). Accordingly, even if parental STEM education is beneficial to children's education, this positive influence is expected to decline as generational status increases among children from highly racialized minority groups (e.g., Blacks and Hispanics).

In summary, prior studies provide an insufficient basis for systematically assessing the implications of parental STEM education for the educational outcomes of children. Even though there are many theoretical reasons to expect the children of STEM graduates to have higher levels of attainment compared to the children of non-STEM graduates, empirical studies examining these differences are generally unavailable. Prior studies further lack conclusive evidence on whether the children of immigrant STEM graduates have higher levels of achievement compared to the children of similarly educated parents in U.S.-born families. Moreover, they provide a limited basis for determining how having parents with STEM degrees can shape intergenerational differences in the outcomes of the children of immigrants.

Hypotheses

Our analysis advances the literature by testing three hypotheses. The first is that the children of STEM graduates have a lower risk of falling behind in school compared to the children of non-STEM graduates. As implied by research on social learning theory (Chlosta et al. 2012; Dryler 1998), parents with STEM degrees are expected to have a positive influence on children's academic performance that allows their children to perform exceptionally well in school. Our second hypothesis is that, among the children of STEM graduates, those in immigrant families will have more favorable outcomes compared to their counterparts in U.S. native families. This expectation is based on previous research suggesting that the influence of social learning may be stronger in immigrant than in U.S. born families (Raleigh and Kao 2010; Kao and Tienda 1995). Our third hypothesis is that, among the children of immigrants, the positive relationship between parental STEM education and schooling progress will decline between the first and second generations among children from racial minority groups. Consistent with segmented assimilation theory (Portes and

Zhou 1993), therefore, we expect children from the most racialized minority groups to have the least favorable improvements in their schooling outcomes as generational status increases.

Data and Methods

We test these hypotheses using data from the five-year 2013–2017 sample of the American Community Survey (ACS) available in the Integrated Public Use Microdata Series (IPUMS) database of the Minnesota Population Center (Ruggles et al. 2019). These data provide information on standard demographic, socioeconomic, and contextual-level indicators of parents and their children. Besides the fact that the ACS contains one of the largest, nationally-representative samples of immigrants in the U.S., it also provides measures of educational attainment that are critical for achieving the objectives of this study. Unique household identification indicators and household relationship codes further make it possible to link the outcomes of parents with those of their children. Using this information, we restrict our analytical sample to children between ages 12 and 17 in households with a minimum of one parent with at least a bachelor's degree.

Our dependent variable is a measure of *low grade-for-age*, which we use as a proxy measure of delayed schooling progress. A number of studies have used similar measures to examine grade retention (e.g., Oreopolous, Page, and Stevens 2006), while others have demonstrated their utility for predicting schooling dropout, test scores, and subsequent labor market outcomes (Hauser 2000; Jimerson 1999). Using information on the age of children and their current grade of enrollment, we define low-grade-for-age as a dummy variable equal to 1, if children's current age minus their grade is > 6, and equal to 0 if this difference is ≤ 6[1]. The logic of this strategy is illustrated in the following example. Twelve-year-old children enrolled in the sixth grade are assumed to be making normal progress through school, (i.e., their age minus their grade is equal to 6), and as such, their outcomes are coded as 0. On the contrary, their age counterparts enrolled in the fifth grade are assumed to have experienced some form of grade retention (i.e., their age minus their grade is equal to 7) and their outcomes are coded as 1. We checked robustness of our results to the use age differences of 5 and 7 and found that our main findings remained unchanged.

Four key independent variables are used in the analysis. *Parental field of study* is determined using information on the fields of study of college graduates available in the ACS. Using these data, we identify families with parents who graduated with degrees in five broad areas of study: STEM, Social Sciences, Arts/Humanities, Business, and Other fields (e.g., Cosmetology Services and Culinary Arts; Physical Fitness, Parks, and Recreation). Families with college-educated parents who have degrees in different fields are classified based on the field of study of household heads. We then use children in families with only non-graduate parents as a reference group to which our main groups of children are compared. Children in *immigrant families* are defined as children in families in which either the household head or the spouse of the household head is foreign-born (Landale et al. 2011). By contrast, children in *U.S. born families* live in families with only U.S. born parents. For the children of immigrants, we also use information on country of birth as well as age of arrival for those born abroad, to construct various proxy measures of *generational status*. First generation

children are defined as children born in countries other than the U.S. As in previous studies (e.g., Rumbaut 2004), we further classify these children into the following decimal generations: 1.75 generation children, defined as children who arrived in the U.S. before age 6; 1.5 generation children are children who arrived between ages 6 and 12, and 1.25 generation children are defined as children who arrived in the U.S. between ages 13 and 17. Second generation children are defined as the U.S. born children of immigrants.

Several additional variables are used as controls. English proficiency is used to measure English speaking ability and is coded as 1 if children speak English very well or speak only English, and as 0 if their English-speaking ability is lower. A proxy measure of country of schooling is used to account for the limited transferability of parental foreign credentials. Following, Mattoo et al. (2008), foreign- and US- educated immigrant parents are distinguished using data on their age at arrival and highest level of education. This strategy helps us identify individuals who arrived in the U.S. at ages before which various levels of education are typically completed. For example, immigrant parents who arrived in the U.S. before age fifteen, who now have a bachelors degree, are assumed to have earned their degrees in the U.S. Three dummy variables are used to capture the region of origin of parents and identify those from countries in Asia, Europe, or other parts of the world. Race-ethnicity is measured using dummy variables identifying individuals who are either Asian, Black, Hispanic, White or from other groups. Additionally, at the household level, we include controls for the highest level of parental schooling, family size, income, and structure.

Our analytical strategy is based on the use of logistic regression models to examine the association between schooling progress and parental fields of study. Standard errors are adjusted to account for the clustering of children within households, and all regression models are estimated with person weights available in the ACS. The general form of each of our estimation models is0020as follows:

$$Y_{ij} = \alpha + \beta_a PF_{ij} + \beta_b C_{ij} + \beta_c H_{ij} + \epsilon_{ij} \quad (1)$$

$$Y_{ij} = \alpha + \beta_a IM_{ij} + \beta_b C_{ij} + \beta_c H_{ij} + \epsilon_{ij} \quad (2)$$

$$Y_{ij} = \alpha + \beta_a G_{ij} + \beta_b C_{ij} + \beta_c H_{ij} + \epsilon_{ij} \quad (3)$$

In equation 1, the outcome variable, Y_{ij},is the logit of the probability of falling behind in school for child i in household j. This probability is dependent on parental fields of study, PF; a vector of child level characteristics C, including age, sex, and whether they are proficient in English; household and parental-level characteristics, H, and an error term, ϵ, that is logistically distributed. Equation 1 uses PF to examine whether the children of STEM graduates are less likely to fall behind in school compared to children whose parents have degrees from other fields of study. We examine these differences separately for children in immigrant and U.S. born families. In equation 2, which is only estimated for the children of STEM graduates, the main focus of interest is on IM, which captures whether or not children

live in immigrant families. Additionally, equation 3 is estimated using data from the children of immigrants to examine the association between falling behind in school and, *G*, which measures differences in generational status.

Results

Summary descriptions of the characteristics of children in the sample are presented in Table 1. The children of STEM graduates in immigrant and U.S. born families represent 4.2% and 9.9% respectively of all children in the sample. The corresponding percentages for the children of non-STEM graduates are much higher, and in both immigrant and U.S. born families, these graduates are disproportionately more likely to have degrees in Business or in the Social Sciences. Although the main groups of children are similar in their age and sex distributions, several notable differences are observed in their individual and household level characteristics. One of these is associated with their racial characteristics. In immigrant families, for example, the children of STEM graduates are most likely to be Asian, although most children in these contexts are from racial minority groups. This racial distribution, however, stands in stark contrast to the corresponding distributions found in U.S.-born families, where children are predominantly White, especially in families with parents who graduated with STEM degrees.

Other important variations shown in Table 1 are specific to the characteristics of children in immigrant families. For example, the children of immigrant STEM graduates are the most likely to be foreign-born (i.e., first generation), and slightly more than half of them are proficient English speakers. In STEM and non-STEM families, more than a third of all children have at least one immigrant parent who obtained their highest university-level credential from another country. Another notable variation found among immigrant families is that associated with parental regions of origin. As the results indicate, there is a distinct over-representation of immigrants from Asia among household heads and their spouses in the families of STEM graduates. By contrast, parents in the families of non-STEM graduates and only non-graduates are most likely to come from other world regions.

As expected, Table 1 confirms that the children of STEM graduates live in households with the most favorable socioeconomic characteristics found in the sample. This is true in the families of both immigrant and US-born STEM graduates, where children have a comparatively lower likelihood of living with single-parents or in female-headed households. Apart from this, the children of STEM graduates also live in families with the best objective indicators of socioeconomic status. However, many of these advantages tend to be concentrated in the families of immigrant STEM graduates. Children in these families, for example, are the most likely to have at least one parent with a PhD. Furthermore, they also have the highest levels of family income in the sample. These favorable socioeconomic indicators are found to a lesser degree in the families of U.S. born STEM graduates. Nevertheless, children in these families are still twice as likely to have a parent with a PhD compared to their counterparts in U.S-born, non-STEM families, and have the second highest family incomes in the sample.

Results shown at the bottom of Table 1 provide our first evidence of empirical support for hypothesis 1. As predicted by social learning theory, in both immigrant and U.S-born families, the children of STEM graduates have a lower prevalence of delayed schooling progress compared to the children of non-STEM graduates. Significantly, however, it is among the children of immigrant STEM graduates that we observe the most favorable outcomes. On average, only 3.5% of them are at lower grades for their ages compared to 4.3% among the children of STEM-educated parents in U.S. born families.

We examine the robustness of these inequalities to the influence of individual and household level factors in Table 2. At the same time, we use our expanded classification of fields of study to investigate how the children of STEM graduates compare with the children of graduates of specific non-STEM fields. Models 1 and 3 respectively present baseline models for children in immigrant and US-born families. Results from a Wald test indicated that there were differences in the effects of the coefficients between these two models (*Chi2*, 47.13; $p<0.001$). Nevertheless, the results generally continue to show support for hypothesis 1, especially in immigrant families. For example, the baseline model (Model 1) indicates that, in these families, having parents with STEM degrees is associated with a lower comparative risk of falling behind in school compared to having parents with other kinds of degrees. Compared to the reference group, for example, the children of immigrant STEM graduates are 60% less likely to experience delayed schooling progress; these odds are the lowest observed among children in immigrant families. Closely following their outcomes are those of the children of Social Science graduates, as well as their peers with parents who had degrees in business.

After controlling for other individual and household level factors (Model 2), the results show that relative advantage of the children of STEM graduates in immigrant families declines but does not disappear. At the same time, in terms of magnitude, their odds of falling behind in school are almost identical to those of the children of immigrant Social Science graduates Notably, however, Model 2 shows that accounting for the full suite of controls does not eliminate the relative advantage of the children of immigrant STEM graduates compared to children with parents from other non-STEM degree fields, with the exception of those born to Social Science graduates. Accordingly, the relative advantage of the children of STEM graduates compared to most groups of children is neither explained by demographic differences or by disparities in socioeconomic resources found in their families.

Shifting attention to children in U.S. born families, Model 3 highlights a key difference in the inequalities observed in these contexts and those observed in immigrant families. Specifically, it shows no baseline difference in the outcomes of the children of STEM and Social Science graduates. Both groups of children are about 56% less likely to fall behind in school compared to children in the reference group, and their estimated odds ratios are statistically similar (*Chi2* = 0.18; $p=0.67$). Within U.S. born families, the children of STEM graduates are also only slightly less likely to fall behind in school compared to the children of Business graduates (*Chi2*, 4.69; $p<0.05$). Yet, as observed in immigrant families, the children of STEM graduates have substantially lower odds of falling behind in school compared to the children of graduates with degrees in the Arts/Humanities or other fields of

study. For the most part, the inequalities remain unchanged after other factors are controlled (Model 4).

Other dimensions of inequality in the two major family contexts are highlighted in the full models presented in Table 2 (Models 2 & Models 4). In U.S-born families (Model 4), for example, Black children and children of other races have significantly higher risks of falling behind in school compared to children who are White. By contrast, in immigrant families, none of these racial minorities have a higher comparative risk of lagging behind after other factors are controlled. English proficiency is associated with a higher likelihood of falling behind in school in immigrant families, net of other controls. Additional analysis using a bivariate model that only controls for English proficiency showed the expected negative association between English proficiency and delayed schooling progress. Other inequalities observed in Model 2 are associated with variations in immigrant-specific characteristics. For example, the results show a negative association between generational status and the odds of falling behind in school. Additionally, the odds of delayed schooling progress are lowest among children with household heads from Asia countries and spouses of household heads from countries in Europe.

The next stage of the analysis examines whether there is empirical support for the second hypothesis. Using data for only children of STEM graduates, it addresses the question of whether parental STEM education is associated with a lower risk of falling behind in school in immigrant than in U.S. born families. This question is addressed in two ways. The first compares the collective outcomes of the children of immigrant STEM graduates and those of all children whose parents have similar credentials in U.S. born households. This is done to test the assertion that the influence of social learning is stronger in immigrant than in U.S. born families. The second examines whether the relative difference between both groups is differentiated by whether immigrant parents earned their degrees in the U.S. or in foreign countries. This strategy is used to investigate whether the limited transferability of foreign credentials among immigrant STEM graduates limits the schooling progress of their children.

As shown in Table 3, our results indicate that the children in immigrant families have a lower collective risk of falling behind in school compared to children in U.S native families. Model 1 indicates that children in the former are 15% less likely to fall behind in school compared to children in the latter. However, after controlling for other individual and contextual factors (Model 2), the advantage associated with living in immigrant families is no longer statistically significant.

When the outcomes of the children of immigrants are distinguished based on whether they have parents with a foreign degree, the results provide a more nuanced perspective. In Model 3, for example, the results indicate that both the children of STEM-educated immigrants with either domestic or foreign degrees have lower baseline odds compared to children in U.S. born families. However, having immigrant parents with U.S. STEM credentials is associated with a lower risk of falling behind in school compared to having immigrant parents with similar degrees obtained elsewhere. Indeed, of the two groups of children of STEM graduates only those whose parents have U.S. STEM degrees have statistically

significant lower odds of falling behind in school than the children of U.S. born STEM graduates. Controlling for child and household-level factors (Model 4) leads to a notable change in the conditional experiences of the children of immigrants; that is, the lower odds associated with having parents with U.S. credentials become only marginally significant. Given the fact that Model 4 also accounts for other household levels differences, this finding suggests that the baseline outcomes of the children of foreign-educated immigrants may be partly driven by the influence of factors such as the level of resources available in their families.

In summary, two major findings have been presented in the analysis so far. First, as suggested by social learning theory, children's risks of falling behind in school are clearly differentiated by variations in parental field of study. This differentiation occurs most prominently in immigrant families, where the children of STEM graduates generally have more favorable outcomes compared to children whose parents have non-STEM degrees. Second, the high achievement patterns of the children of immigrant STEM graduates carries over in comparisons of their outcomes with those of children with similarly educated parents in U.S-born families, which is consistent with research suggesting that social learning is stronger in immigrant than in U.S. born families. When these two groups are compared, the results also show that the lower collective risks of the children of immigrant STEM graduates are partly explained by differences in their individual and household level characteristics.

We now turn our attention to investigating the third hypothesis, which draws on segmented assimilation theory to examine the implications of parental STEM education for intergenerational differences in schooling progress among the children of immigrants. We use inter-generational differences among these children to make inferences about the incorporation process from two perspectives. First, we examine whether inter-generational differences among the children of STEM graduates differ from those of the children of graduates from the various non-STEM fields. Second, we investigate whether intergenerational differences among the former vary depending on the race-ethnicity of children.

Results presented in Table 4 indicate that, among the children of STEM graduates, generational status is negatively associated with the odds of delayed schooling progress. Children with the least exposure to U.S. society (i.e., 1.0 generation children) have the highest odds of falling behind in school, and these odds decline sequentially as generational status increases Part of the disadvantage of the 1.0 generation children may be due to the disruptive effects of migration itself on their educational outcomes. Yet, the results show generally similar patterns of association among the children of immigrants with degrees in other fields of study. These associations should be viewed as generally descriptive, not definitive, since a Wald test indicated that there are differences in the effects of the variables used in the models across in the five sub-samples of children (*Chi2*, 136.6, $p<0.01$).

A closer look at the findings, however, shows an important pattern related to the intergenerational outcomes of the children of STEM graduates. It is among this group that the results show odds of falling behind in school among 1.75- generation children

that are significantly lower than those of their second-generation peers. This suggests that having parents who are STEM graduates is associated with the elimination of disparities in educational outcomes among the 1.5- and second-generation children.

Table 4 further indicates that the outcomes of the children of immigrant STEM graduates differ from those of the children of other immigrant graduates in other important ways. In particular, the results in Table 4 show that children of immigrant STEM graduates are one of two groups of children whose observed risks of falling behind in school are negatively associated with having household heads from Asian countries. This finding is consistent with prior studies that find generally higher levels of achievement among children in Asian immigrant families (Harris et al. 2008).

A second perspective on the educational incorporation of children is provided by predicted probabilities of the risk of falling behind in school, differentiated by race-ethnicity and parental field of study. In the top panel of Table 5, the results show a negative association between the predicted probability of falling behind in school among the children of STEM graduates in each of the four major racial groups. In terms of magnitude, these estimates are higher among Blacks and Hispanics than among Whites and Asians. Moreover, among children from the three race-ethnic minority groups, Blacks have the largest difference in the predicted probability of falling behind in school between 1.0 and second-generation children of STEM graduates. Specifically, the respective difference among Blacks (76%) is only surpassed by that for Asians (76.4%). In other words, increases in immigrant generation do not appear to be associated with lower improvements in schooling for Blacks and Hispanics compared to Whites among the children of STEM graduates. This pattern is similar to that found among the children graduates of the various non-STEM fields of study.

Discussion and Conclusion

Motivated by the limited scholarly focus on the wellbeing of the children of STEM graduates, this study has investigated the extent to which their patterns of educational achievement differ from those of other children. Given the increasing contribution of the foreign-born to the pool of STEM graduates (Gambino and Gryn 2011; Lowell 2010), our analysis specifically addressed the question of whether these achievements patterns vary in immigrant and U.S. born households. In addressing this question, our analysis makes at least two contributions to the literature. First, it demonstrates that parental STEM education shapes inequalities in the educational progress of children especially among immigrants. Like the children of other graduates, the children of STEM graduates have more positive outcomes compared to children whose parents lack university credentials. Unlike the families of other graduates, however, the families of STEM graduates also have a positive influence on the educational progress of children that is generally unmatched in our sample. Second, our analysis advances the emerging literature on the importance of STEM education in contexts other than the labor market (Ma 2013; Museus et al. 2011). Situating our analysis within the context of social learning and parental influence within families, we show that the importance of parental STEM education can be observed from several perspectives.

We began by showing that in both immigrant and US native families, there are distinct inequalities in children's risk of falling behind in school associated with variations in parental fields of study. In line with our first hypothesis, which is informed by social learning theory (Chlosta et al. 2012; Dryler 1998), we found that the children of STEM graduates generally have a lower risk of falling behind in school compared to the children of non-STEM graduates. Our results further suggest that the strength of the influence of parental STEM education is generally consistent in immigrant families. However, the advantage associated with parental STEM education slightly declines after demographic and familial socioeconomic differences are controlled. Children in the families of STEM graduates not only have access to more favorable familial socioeconomic resources, they also tend to live in contexts devoid of the adverse influence of structural factors (e.g., single-parent households) known to negatively affect schooling.

In immigrant families, our results show that accounting for these factors reduces the overall advantage of the children of STEM graduates. However, their outcomes remained superior to those of other children, except for those whose parents have degrees in the Social Sciences. While our results showed that the corresponding STEM advantage was weaker in U.S. born families, we also found that these contextual factors had a similar influence on children's schooling in these families. Both immigrant and U.S. born families are also similar in another regard. In both contexts, we found consistent evidence indicating that the children of STEM graduates had more favorable outcomes compared to the children of graduates with degrees in business, the arts/humanities, and other fields of study.

Our analysis is limited in its ability to capture the effects of direct indicators of the parental influence useful for assessing the implications of social learning theory. Nevertheless, it is difficult to ignore the possibility that these influences may account for the more favorable outcomes observed among the children of STEM graduates. We cannot discount the positive implications of parental communication about the value of STEM education on children's academic performance in these families (Rozek et al. 2017). Similarly, it is in these contexts that children are most likely to have parental role models who were themselves students who had the favorable rates of schooling progress and low dropout rates associated to STEM education (Plasman and Gottfried 2016; Whalen and Shelley 2010). When more appropriate data become available, future studies could examine whether or why the effectiveness of these influences varies in non-STEM families.

When our analysis focused only on the outcomes of the children of STEM graduates, our results confirmed the second hypothesis, which states that children in immigrant households are collectively less likely to fall behind in school compared to children in U.S.-born families. One interpretation of this finding is that the positive influence on schooling associated with having STEM graduates as parents is likely to be more prevalent in the former than in the latter. If this argument is correct, it will be consistent with evidence suggesting that there are stronger patterns of social learning and parental influence in immigrant families (Raleigh and Kao 2010; Kao and Tienda 1995). This evidence, for example, shows higher levels of optimism in immigrant families and a greater tendency among immigrant parents of reinforcing messages about college preparation among their children (e.g., Fuligni 1997; Raleigh and Kao 2010).

Still, our results imply that these influences are not equally distributed across all immigrant families. In particular, we find support for the influence of the limited transferability of foreign credentials among immigrants. In other words, our results show that having immigrant parents with U.S. credentials is associated with lower risks of falling behind in school compared to having immigrant parents with foreign-education credentials. To some extent, we consider this finding to be intuitive. Parents educated in the U.S. are more familiar with the U.S. education system compared to their foreign-educated peers and may thus be better equipped to supervise their children appropriately. The mere fact that this inequality exists is however concerning. In particular, it adds to growing literature showing the various ways in which foreign-education can limit the social and economic integration of immigrants into society (Mattoo et al. 2008; Tong 2010).

Our analysis nevertheless provides mixed evidence for the hypothesis that having immigrant parents who are STEM graduates can have differential implications for intergenerational differences in the educational incorporation of children. On one hand, our results imply that the children of STEM graduates experience a convergence in their schooling outcomes between 1.75 and second-generation. On the other hand, we fail to find evidence that there are smaller intergenerational differences in the outcomes of children from racial minority groups than among their counterparts who are White, which is what segmented assimilation theory predicts.

Taken together, our findings indicate that STEM education has important second-order implications that have not been fully recognized in the existing literature. Far from just simply promoting innovation and helping the U.S. compete in the global economy, it also helps to improve the educational achievement of the children of STEM graduates. Interestingly, our results suggest that these benefits may also be found in families with parents who have degrees in the Social Sciences.

Although our findings are of general theoretical importance, it is difficult to ignore what they also imply for policy. Our results suggest that the advantages of policies that promote the recruitment of immigrants with STEM degrees extend beyond their utility for exploiting the potential contributions of these immigrants to the economy. In addition to this, the high academic performance of their children can potentially extend the pipeline of skilled workers in the labor market, while also helping to enrich the overall experiences of children in U.S. schools. Therefore, proposed limits to the number of H1B visas used to recruit highly skilled immigrants generally discount these contributions. As a result, new policies are needed to both encourage the recruitment of immigrant STEM workers in occupations for which qualified U.S. born workers are unavailable, and speedily facilitate the reunification of their families. More research is, however, needed to determine whether the children of immigrant STEM graduates have more favorable outcomes than the children of native-born graduates in countries using a points-based immigration system. Findings showing an educational advantage among the children of immigrant STEM graduates in these contexts may necessitate a revisiting of the system to award even more points to immigrants with STEM degrees.

Despite the importance of our findings, it is important to note that our analysis has several limitations. Arguably the most important is the fact that our results are derived from cross-sectional data, which limits our ability to identify precise causal pathways. In addition, our analysis focuses on only one measure of educational attainment, schooling progress. As a result, more research is needed to determine whether similar disparities exist in other measures of educational achievement. Also unobserved in our analysis are measures of school quality, parental education-occupation mismatch status, and other non-familial influences that could help us draw more robust conclusions about differences in the outcomes of the children of STEM and non-STEM graduates.

Our analysis also raises other questions that still remained unanswered. For example, it is not clear whether the influence of parental STEM education further varies among graduates of specific disciplines (e.g., Math and Physics). Additionally, parental STEM education may have other implications for the welfare of children in ways that are not fully addressed in our analysis. This study, therefore, represents an important step in unpacking the evidence on these implications. Additional studies will be needed to provide more insight into these processes, and in so doing, increase our understanding of how parental educational credentials affect the wellbeing of children.

Acknowledgments

We would like to acknowledge support for this project from grant # P2CHD041025 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development to the Population Research Institute of the Pennsylvania State University

References

Angrist Joshua D., and Krueger Alan B.. “The effect of age at school entry on educational attainment: an application of instrumental variables with moments from two samples.” Journal of the American statistical Association 87.418 (1992): 328–336.

Astin Alexander W., and Astin Helen S.. “Undergraduate science education: the impact of different college environments on the educational pipeline in the sciences. Final report.” (1992).. Los Angeles: Higher Education Research Institute.

Atkinson Robert D., and Merrilea Joyce Mayo. “Refueling the US innovation economy: Fresh approaches to science, technology, engineering and mathematics (STEM) education.” The Information Technology & Innovation Foundation (2010), https://files.eric.ed.gov/fulltext/ED521735.pdf

Batalova Jeanne, Fix Michael, and Bachmeier James D.. “Untapped Talent: The Costs of Brain Waste among Highly Skilled Immigrants in the United States.” World Education Services (2016).

Beede David N., et al. “Women in STEM: A gender gap to innovation.” Economics and Statistics Administration Issue Brief 04–11 (2011).

Blackwell E, & Pinder P. (2014). What are the motivational factors of first-generation minority college students who overcome their family histories to pursue higher education?. College Student Journal, 48(1), 45–56.

Bottia MC, Stearns E, Mickelson RA, Moller S, & Parker AD (2015). The Relationships among High School STEM Learning Experiences and Students’ Intent to Declare and Declaration of a STEM Major in College. Teachers College Record, 117(3), n3.

Boussiakou Leda G., and Kalkani Efrossini C.. “The needs in continuing education courses for professional engineers.” World Transactions on Engineering and Technology Education 6.2 (2007): 215.

Bybee Rodger W. “What is STEM education?.” Science, (2010): 996–996.

Cai Zhengyu, and Winters John V.. “Self-employment differentials among foreign-born STEM and non-STEM workers.” Journal of Business Venturing 32.4 (2017): 371–384.

Chlosta Simone, et al. “Parental role models and the decision to become self-employed: The moderating effect of personality.” Small Business Economics 38.1 (2012): 121–138.

Coelli Michael B. “Parental job loss and the education enrollment of youth.” Labour Economics 18.1 (2011): 25–35.

Davis WT, & Ogbu John, Black American Students in An Affluent Suburb: A Study of Academic Disengagement (Sociocultural, Political, and Historical Studies in Education). Routledge (2003); 1st edition Mahwah, NJ:

Dorie Brianna L.; Jones Tamecia R.; Pollock Meagan C; and Cardella Monica, “Parents as Critical Influence: Insights from Five Different Studies” (2014). School of Engineering

Education Graduate Student Series. Paper 55. http://docs.lib.purdue.edu/enegs/55

Drake Sean. “Academic segregation and the institutional success frame: Unequal schooling and racial disparity in an integrated, affluent community.” Journal of Ethnic and Migration Studies 43.14 (2017): 2423–2439.

Dryler Helen. “Parental role models, gender and educational choice.” British journal of Sociology (1998): 375–398.

Eng Norman. “The impact of demographics on 21st century education.” Society 50.3 (2013): 272–282.

Fuligni Andrew J. “The academic achievement of adolescents from immigrant families: The role of family background, attitudes, and behavior.” Child development 68.2 (1997): 351–363. [PubMed: 9180006]

Gambino Christine, and Gryn Thomas. “The Foreign Born with Science and Engineering Degrees: 2010. American Community Survey Briefs. ACSBR/10–06.” US Census Bureau (2011).

Gesing Peggy, and Glass Chris. “STEM student mobility intentions post-graduation and the role of reverse push-pull factors.” International Journal of Educational Development 65 (2019): 227–236.

Grandy J. (1992). Graduate enrollment decisions of undergraduate science and engineering majors: A survey of GRE test takers. ETS Research Report Series, 1992(2), i–45.

Grigoleit-Richter Grit. “Highly skilled and highly mobile? Examining gendered and ethnicised labour market conditions for migrant women in STEM-professions in Germany.” Journal of Ethnic and Migration Studies 43.16 (2017): 2738–2755.

Gordon MM (1964). Assimilation in American life: The role of race, religion, and national origins. Oxford University Press on Demand.

Harris Angel L., Jamison Kenneth M., and Trujillo Monica H.. “Disparities in the educational success of immigrants: An assessment of the immigrant effect for Asians and Latinos.” The ANNALS of the American Academy of Political and Social Science 620.1 (2008): 90–114.

Hauser Robert M. “Should We End Social Promotion? Truth and Consequences.” (2000). Center for Demography and Ecology, University of Wisconsin-Madison

Hirschman Charles. “The educational enrollment of immigrant youth: A test of the segmented-assimilation hypothesis.” Demography 38.3 (2001): 317–336. [PubMed: 11523261]

Ho Phoebe, and Kao Grace. “Educational achievement and attainment differences among minorities and immigrants.” Handbook of the Sociology of Education in the 21st Century. Springer, Cham, 2018. 109–129.

Ing Marsha. “Can parents influence children’s mathematics achievement and persistence in STEM careers?.” Journal of Career Development 41.2 (2014): 87–103.

Jimerson Shane R. “On the failure of failure: Examining the association between early grade retention and education and employment outcomes during late adolescence.” Journal of school psychology 37.3 (1999): 243–272.

Kanematsu Hideyuki, and Barry Dana M.. “The importance of STEM for modern education.” STEM and ICT Education in Intelligent Environments. Springer, Cham, 2016. 25–30.

Kao Grace, and Tienda Marta. “Optimism and Achievement: The Educational Performance of Immigrant Youth.” Social Science Quarterly. (1995): 1.

Landale Nancy S., Thomas Kevin J.A, and Van Hook Jennifer. “The living arrangements of children of immigrants.” The future of children/Center for the Future of Children, the David and Lucile Packard Foundation 21.1 (2011): 43.

Langdon David, et al. “STEM: Good Jobs Now and for the Future. ESA Issue Brief# 03–11.” US Department of Commerce (2011).

Lindsay Lowell B. “A long view of America’s immigration policy and the supply of foreign-born STEM workers in the United States.” American Behavioral Scientist 53.7 (2010): 1029–1044.

Ma Yingyi. “Family socioeconomic status, parental involvement, and college major choices—gender, race/ethnic, and nativity patterns.” Sociological Perspectives 52.2 (2009): 211–234.

Mattoo Aaditya, Ileana Cristina Neagu, and Çağlar Özden. “Brain waste? Educated immigrants in the US labor market.” Journal of development economics 87.2 (2008): 255–269.

Mithas Sunil, and Lucas Henry C. Jr. “Are foreign IT workers cheaper? US visa policies and compensation of information technology professionals.” Management Science 56.5 (2010): 745–765.

Mogstad Magne. “The human capital approach to intergenerational mobility.” Journal of Political Economy 125.6 (2017): 1862–1868.

Museus Samuel D., et al. Racial and Ethnic Minority Student Success in STEM Education: ASHE Higher Education Report, Volume 36, Number 6. John Wiley & Sons, 2011.

National Academy of Sciences (NAS), National Academy of Engineering, and Institute of Medicine. (2007). Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future.

Ogbu John U., and Simons Herbert D.. “Voluntary and involuntary minorities: A cultural-ecological theory of school performance with some implications for education.” Anthropology & education quarterly 29.2 (1998): 155–188.

Oreopoulos Philip, Page Marianne E., and Ann Huff Stevens. “The intergenerational effects of compulsory schooling.” Journal of Labor Economics 24.4 (2006): 729–760.

Pennock Román María. “Precollegiate Curricula, University Characteristics, and Field Persistence Among Science Majors.” ETS Research Report Series 1999.1 (1999): i–95.

Perreira Krista M., Kathleen Mullan Harris, and Dohoon Lee. “Making it in America: High school completion by immigrant and native youth.” Demography 43.3 (2006): 511–536. [PubMed: 17051825]

Pivnick Lilla K. “Nonparental Caregivers, Parents, and Early Academic Achievement Among Children from Latino/a Immigrant Households.” Sociological Perspectives 62.6 (2019): 884–906.

Plasman Jay Stratte, and Gottfried Michael A.. “Applied STEM coursework, high school dropout rates, and students with learning disabilities.” Educational Policy 32.5 (2018): 664–696.

Portes Alejandro, Patricia Fernandez-Kelly, and William Haller. “Segmented assimilation on the ground: The new second generation in early adulthood.” Ethnic and racial studies 28.6 (2005): 1000–1040.

Portes Alejandro, and Zhou Min. “The new second generation: Segmented assimilation and its variants.” The annals of the American academy of political and social science 530.1 (1993): 74–96.

Raleigh Elizabeth, and Kao Grace. “Do immigrant minority parents have more consistent college aspirations for their children?.” Social Science Quarterly 91.4 (2010): 1083–1102.

Rozek Christopher S., et al. “Utility-value intervention with parents increases students’ STEM preparation and career pursuit.” Proceedings of the National Academy of Sciences 114.5 (2017): 909–914.

Ruggles Steven, et al. “Jose Pacas, and Matthew Sobek, IPUMS USA, version 8.0, Minneapolis: Integrated Public Use Microdata Series, 2018.” (2018).

Ruiz Neil G., and Budiman Abby. “Number of Foreign College Students Staying and Working in US after Graduation Surges.” Pew Research Center (2018).

Rumbaut Rubén G. “Ages, life stages, and generational cohorts: decomposing the immigrant first and second generations in the United States 1.” International migration review 38.3 (2004): 1160–1205.

Sonnert Gerhard. “Parents who influence their children to become scientists: Effects of gender and parental education.” Social Studies of Science 39.6 (2009): 927–941. [PubMed: 20506745]

Stypek Deborah “School entry age”, in Tremblay RE, Barr RG, Peters RDeV, eds. Encyclopedia on Early Childhood Development, Montreal, Quebec: Center of Excellence for Early Childhood Development; 2003;1–5.

Sweetman Arthur, and Warman Casey. “Canada’s immigration selection system and labour market outcomes.” Canadian Public Policy 39.Supplement 1 (2013): S141–S164.

Takanishi Ruby, and Menestrel Suzanne Promoting the Educational Success of Children and Youth Learning English: Promising Futures. Consensus Study Report. National Academies Press, 2017.

Tong Yuying. “Place of education, gender disparity, and assimilation of immigrant scientists and engineers earnings.” Social Science Research 39.4 (2010): 610–626.

U.S. Department of Commerce. 2016 “Foreign-born STEM workforce in the United States”. U.S. Census Bureau: Paper presented at the Annual Meeting of the Population Association of America, April, 2, 2016.

U.S. Immigration and Customs Enforcement (ICE) “STEM Designated Degree Program List Effective May 10, 2016”: https://www.ice.gov/sites/default/files/documents/Document/2016/stem-list.pdf

Whalen Donald F., and Shelley Mack C.. “Academic success for STEM and non-STEM majors.” Journal of STEM Education: Innovations and research 11.1 (2010).

Warner William Leo Srole The Social Systems of American Ethnic Groups, New Haven: Yale University Press, (19945)

Zeidler Dana L. “STEM education: A deficit framework for the twenty first century? A sociocultural socioscientific response.” Cultural Studies of Science Education 11.1 (2016): 11–26.

Table 1:

Unweighted descriptive statistics of the main groups of children in the sample

	Immigrant families			U.S. Born families		
	STEM	**Non-STEM**	**No College**	**STEM**	**Non-STEM**	**No College**
Age (mean)	14.4	14.4	14.5*	14.5*	14.5*	14.5*
Female	48.4	48.5	48.6	48.9*	48.6	48.7
Parental Field of Study						
Arts and Humanities	-	12.41	-	-	11.23	-
Business	-	39.10	-	-	34.59	-
Social Sciences	-	32.06	-	-	30.18	-
Other	-	16.42	-	-	23.99	-
Child race						
Asian	40.4	21.2*	10.9*	1.3*	1.1*	0.5*
Black	6.4	8.2*	6.3	5.0*	6.3	14.5*
Hispanic	15.3	24.2*	66.2*	6.1*	7.0*	13.1*
White	29.8	37.4*	13.4*	83.7*	81.6*	65.9*
Other	8.1	8.9*	3.2*	3.9*	4.1*	6.1*
First generation	21.2	18.5*	18.7*	-	-	-
English proficient	56.0	61.1*	33.8*	97.0*	96.9*	94.2*
One immigrant parent	39	59.1*	47.5*			
Two immigrant parents	61	40.9*	52.5*			
Household head from Asia	46.8	26.8*	13.5*			
Household head from Europe	12.2	13.2*	5.6*			
Household head from other regions	41.0	60.0*	80.9*			
Spouse from Asia	46.0	26.8*	11.2*			
Spouse from Europe	11.2	13.2*	4.3*			
Spouse from other regions	42.8	60.0*	84.5*			
Parent with foreign degree	44.4	37.3*	-	-	-	-
Single-parent family	8.4	12.4*	27.5*	14.3*	17.5*	41.9*
Married Household head	92.8	89.2*	75.1*	86.4*	83.4*	60.0*
Female household head	29.2	45.1*	46.6*	41.5*	52.2*	60.1*
Age of household head (Mean)	47.9	47.4*	44.1*	46.8*	46.4*	42.8
At least one parent has a PhD.	12.6	5.7*	0.0	6.5*	3.5	0.0
Family income (Mean)	175,980	145,460*	57,010*	168,990*	153,790*	65,020*
Family size (Mean)	4.4	4.1	4.9*	4.3*	4.2*	4.3*

	Immigrant families			U.S. Born families		
	STEM	**Non-STEM**	**No College**	**STEM**	**Non-STEM**	**No College**
Delayed progress	3.45	4.36 *	8.26 *	4.32 *	4.62 *	9.34
N (%)	43,014 (4.1)	51,591 (5.0)	155,433 (15.0)	102,783 (9.9)	249,753 (24.1)	434,147 (41.9)

* $p<0.05$ compared to children in families of immigrant STEM graduates.

Data source: 2013–2017 American Community Survey.

Table 2:

Odds ratios from logistic regression models examining the determinants of schooling progress among children in immigrant and US-born families.

	Immigrant families		US-born families	
	Model 1	**Model 2**	**Model 3**	**Model 4**
Family Type				
STEM	0.41***	0.55***	0.44***	0.54***
	(0.015)	(0.026)	(0.001)	(0.012)
Social Sciences	0.45***	0.54***	0.45***	0.55***
	(0.024)	(0.03)	(0.001)	(0.014)
Arts and Humanities	0.54***	0.67***	0.49***	0.60***
	(0.044)	(0.060)	(0.003)	(0.022)
Business	0.51***	0.62***	0.46***	0.57***
	(0.025)	(0.032)	(0.002)	(0.013)
Other	0.61***	0.69***	0.52***	0.63***
	(0.042)	(0.051)	(0.002)	(0.018)
Non-graduate families (Ref.)	*- 1.00 -*	*- 1.00 -*	*- 1.00 -*	*- 1.00 -*
Age	1.14***	1.12***	1.10***	1.11***
	(0.007)	(0.007)	(0.001)	(0.004)
Female	0.80***	0.80***	0.74***	0.73***
	(0.016)	(0.016)	(0.001)	(0.009)
Asian		0.83**		1.10
		(0.050)		(0.078)
Black		1.06		1.27***
		(0.058)		(0.022)
Hispanic		1.03		0.93*
		(0.045)		(0.020)
Other		0.78***		1.06***
		(0.051)		(0.029)
White (Ref.)		*- 1.00 -*		*- 1.00 -*
English proficient		1.17***		0.75***
		(0.029)		(0.020)
1.0 generation		3.69***		
		(0.172)		
1.5 generation		2.02***		
		(0.067)		
1.75 generation		1.26***		

	Immigrant families		US-born families	
	Model 1	**Model 2**	**Model 3**	**Model 4**
		(0.045)		
Second generation (Ref.)		- *1.00* -		
One immigrant parent		**1.06**		
		(0.034)		
Two immigrant parents (Ref.)		- *1.00* -		
Single-parent family		1.17 ***		1.41 ***
		(0.081)		(0.062)
Married Household head		0.97		1.11 ***
		(0.062)		(0.049)
Female household head		0.93 ***		0.90 ***
		(0.022)		(0.012)
Household head age		0.99 ***		1.00 ***
		(0.002)		(0.001)
Foreign-educated immigrant parent		1.07		
		(0.051)		
Parent has a Phd.		0.83		0.98
		(0.083)		(0.055)
Household head from Asia		0.79 ***		
		(0.045)		
Household head from Europe		0.88 ***		
		(0.048)		
Household head from other regions		- *1.00* -		
Spouse from Asia		0.96		
		(0.047)		
Spouse from Europe		0.77 ***		
		(0.043)		
Spouse from other regions		- *1.00* -		
Family income (log)		0.94 ***		0.91 ***
		(0.005)		(0.028)
Family size		1.09 ***		1.15 ***
		(0.008)		(0.005)
Constant	0.02 ***	0.024 ***	0.03 ***	0.034 ***
Log likelihood	−1511566.9	−1472780	−4239965	−4182086.7

* p<0.05

** p<0.01

*** p<0.001. Standard errors are in parenthesis.

Data source: 2013–2017 American Community Survey.

Table 3:

Odds ratios from logistic regression models examining differences in schooling progress among the children of STEM graduates in immigrant and U.S. born families.

	Model 1	Model 2	Model 3	Model 4
Immigrant families				
All immigrant families	0.85***	0.95		
	(0.039)	(0.086)		
Parents with Foreign credentials			0.95	1.05
			(0.050)	(0.098)
Parents with American credentials			0.77***	0.82+
			(0.040)	(0.084)
U.S. Born families (Ref.)	*- 1.0 -*	*- 1.0 -*	*- 1.0 -*	*- 1.0 -*
Child-level controls	No	Yes	No	Yes
Child and household-level controls	No	Yes	No	Yes
Constant	0.05***	0.04***	0.05***	0.04***
Log likelihood	-509782.9	-501401	-509612	-501196.9

* p<0.05

** p<0.01

*** p<0.001.

+ p<0.10. Standard errors are in parenthesis.

Data source: 2013–2017 American Community Survey.

Table 4:

Odds ratios from logistic regression models examining differences in schooling progress among the children of immigrants with varies types of degrees.

	STEM	S. Sciences	Arts and Hum.	Business	Other
1.0 generation	3.52***	2.91***	5.45***	2.45***	4.52***
	(0.081)	(0.104)	(0.307)	(0.077)	(0.20)
1.5 generation	1.73***	1.22***	2.52***	1.90***	1.48***
	(0.032)	(0.040)	(0.106)	(0.044)	(0.055)
1.75 generation	0.82***	1.12***	1.13*	1.03	1.24***
	(0.018)	(0.035)	(0.054)	(0.027)	(0.047)
Second generation (Ref.)	*- 1.0 -*	*- 1.0 -*	*- 1.0 -*	*- 1.0 -*	*- 1.0 -*
Age	1.12***	1.09**	0.99	1.05*	1.09***
	(0.003)	(0.005)	(0.008)	(0.005)	(0.007)
Female	0.82***	0.81***	0.68***	0.78**	0.76***
	(0.009)	(0.014)	(0.018)	(0.011)	(0.016)
Asian	1.00	0.93	1.44***	0.71***	0.77***
	(0.023)	(0.035)	(0.080)	(0.022)	(0.039)
Black	1.26***	1.68**	1.33***	1.22***	2.48***
	(0.030)	(0.055)	(0.071)	(0.033)	(0.091)
Hispanic	1.48***	1.39***	1.41***	1.06**	1.41***
	(0.029)	(0.038)	(0.059)	(0.025)	(0.047)
Other	0.73***	1.12**	1.12*	0.69***	0.56***
	(0.020)	(0.039)	(0.055)	(0.026)	(0.032)
White (Ref.)	*- 1.0 -*	*- 1.0 -*	*- 1.0 -*	*- 1.0 -*	*- 1.0 -*
English proficient	1.18*	1.14***	1.06	1.00	1.34***
	(0.015)	(0.022)	(0.032)	(0.017)	(0.032)
One immigrant parent	1.29***	1.13***	1.18***	1.22***	0.94*
	(0.030)	(0.028)	(0.043)	(0.024)	(0.027)
Two immigrant parents (Ref.)	- 1.00 -	- 1.00 -	- 1.00 -	- 1.00 -	- 1.00 -
Single-parent family	0.66***	1.77***	0.50***	0.92	0.64***
	(0.033)	(0.089)	(0.070)	(0.052)	(0.060)
Married Household head	0.59***	1.60***	0.35***	0.86**	0.42***
	(0.029)	(0.079)	(0.049)	(0.048)	(0.039)
Female household head	1.01	0.88***	0.80***	0.87***	0.86***
	(0.013)	(0.017)	(0.023)	(0.014)	(0.020)
Household head age	0.98***	1.00	1.01	0.99***	1.00
	(0.001)	(0.001)	(0.002)	(0.00)	(0.002)

	STEM	S. Sciences	Arts and Hum.	Business	Other
Has a foreign-educated parent	1.13***	1.25***	0.78***	1.40***	0.93**
	(0.015)	(0.027)	(0.025)	(0.024)	(0.025)
Parent has a Phd.	0.80***	0.80***	1.40***	0.55***	1.19***
	(0.017)	(0.029)	(0.058)	(0.038)	(0.053)
Household head from Asia	0.79***	1.23***	0.64***	1.12*	1.20***
	(0.017)	(0.040)	(0.032)	(0.031)	(0.051)
Household head from Europe	1.02	1.30***	0.85***	0.91**	1.34***
	(0.021)	(0.038)	(0.036)	(0.025)	(0.048)
Household head from other regions	*- 1.0 -*	*- 1.0 -*	*- 1.0 -*	*- 1.0 -*	*- 1.0 -*
Spouse from Asia	1.08	0.84***	1.23***	0.77***	1.07
	(0.022)	(0.026)	(0.052)	(0.021)	(0.045)
Spouse from Europe	1.20	0.82***	0.98	0.58***	1.24***
	(0.022)	(0.027)	(0.043)	(0.018)	(0.045)
Spouse from other regions	*- 1.0 -*	*- 1.0 -*	*- 1.0 -*	*- 1.0 -*	*- 1.0 -*
Family income (log)	0.89***	0.92***	0.96***	0.93***	0.99
	(0.003)	(0.004)	(0.007)	(0.004)	(0.008)
Family size	1.15***	1.13***	1.06***	1.11***	1.11***
	(0.005)	(0.007)	(0.010)	(0.006)	(0.008)
Constant	0.04***	0.01***	0.10***	0.05***	0.02***
Log likelihood	−138319	−57437	−25027.4	−79996.6	−38608.8

*p<0.05

**p<0.01

***p<0.001. Standard errors are in parenthesis.

Data source: 2013–2017 American Community Survey.

Table 5:

Estimated predicted probabilities of experiencing delayed schooling progress by race, generational status, and parental fields of study.

	Asian	Black	Hispanic	White
STEM				
1.00	0.106	0.192	0.16	0.125
1.50	0.052	0.091	0.081	0.061
1.75	0.032	0.057	0.052	0.042
2.00	0.025	0.046	0.042	0.035
Social Science				
1.00	0.111	0.177	0.160	0.131
1.50	0.054	0.091	0.084	0.066
1.75	0.033	0.061	0.053	0.046
2.00	0.026	0.045	0.041	0.035
Arts and Humanities				
1.00	0.130	0.245	0.201	0.168
1.50	0.069	0.119	0.101	0.080
1.75	0.041	0.080	0.058	0.053
2.00	0.032	0.056	0.050	0.044
Business				
1.00	0.124	0.197	0.177	0.152
1.50	0.061	0.101	0.090	0.073
1.75	0.039	0.066	0.059	0.049
2.00	0.029	0.052	0.047	0.040
Other				
1.00	0.140	0.228	0.202	0.166
1.50	0.070	0.113	0.102	0.080
1.75	0.044	0.072	0.068	0.057
2.00	0.035	0.058	0.053	0.046

Note: These probabilities are estimated using Model 2 in Table 2.