

Postsecondary Education Impact on Intergenerational Income Mobility: Differences by Completion Status, Gender, Race/Ethnicity, and Type of Major

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Abstract

This study examined intergenerational mobility among former students of The University of Texas System (n=98,199) by comparing parental household income while the students were in college to students' income five years after exiting the system. The proportion of students who experienced upward mobility relative to their parents were estimated, using a combination of rank-rank slopes, transition matrices, and logistic regression. The results indicated that parental income and college completion are the most important of the studied factors in determining upward mobility. The majority of completers from the bottom two parental income quintiles displayed upward mobility within a few years of graduation and, among students from the bottom quintile, over half of non-completers also had higher incomes relative to their parents. Differences in mobility rates on the basis of gender, race/ethnicity, type of major, institution type, and financial aid type were also explored.

Keywords: intergenerational mobility, transition matrices, rank-rank, logistic regression, education, gender, race/ethnicity, major

Over the last three decades, sociologists and economists have produced a growing body of work pertaining to intergenerational mobility, in particular, the degree to which economic status persists across generations. The interest in intergenerational income mobility stems from the fact that it is considered an important socioeconomic indicator, in that it represents equality (or inequality) of opportunity in a society (Becker & Tomes, 1979; 1986). The OECD (2017a) considers social mobility, in general, a matter of global concern and “an important driver for ensuring that individuals succeed and prosper in a society regardless of their socio-economic background as long as they have talent, try hard and work hard” (p.2). Much of the early literature in intergenerational mobility focused on discussions of the most precise way to measure the construct. However, there has been an increasing consideration of the causal mechanisms behind the relationship of parent and child outcomes (Black & Devereux, 2011).

Education is generally believed to be a path to mediate economic disparities that individuals are born into (see, for example, Blanden, 2013; Causa & Johansson, 2010; Greenstone, Looney, Patashnik, & Yu, 2013; Isaacs, Sawhill, & Haskins, 2008; U.S. Department of the Treasury and Department of Education, 2012) and evidence exists supporting that belief (Bhattacharya & Mazumder, 2011; Blanden, Haveman, Smeeding, & Wilson, 2014; Chay, Guryan, & Mazumder, 2014; Causa & Johansson, 2010; Corak, 2006; Corak, 2013; Gayle, Golan, & Soytaş, 2015; OECD, 2011; OECD, 2017a; OECD, 2017b; Palomino, Marrero, & Rodriguez, 2017; The Pew Charitable Trusts, 2012; The Pew Charitable Trusts, 2015; Zhang, 2015). Much of the research in this area builds upon Becker and Tomes (1979; 1986) model of intergenerational income mobility, where parents impact the financial outcomes of their children by transferring “endowments” (e.g., race, values, genetic traits) and investing capital (both human and nonhuman). Education is one such capital.

The purpose of this paper is to contribute to the literature of education's role in intergenerational income mobility by leveraging the size and diversity of The University of Texas System's (UT System) student population to explore how degree completion, choice of major, student demographic characteristics, and institutional characteristics influence upward mobility. The UT System is a public university system residing in a state with a large Hispanic population, which is expected to grow 2.3 times larger between 2010 and 2050 and surpass the Non-Hispanic White population in 2020 (Office of the State Demographer, 2014). The U.S. Census Bureau (2018) estimates that only 13.3 percent of the Hispanic population in the state has attained a bachelor's degree or higher. The Gini coefficient is a commonly-used measure of inequality (e.g., OECD, 2014; OECD, 2018) and is based on the comparison of cumulative proportions of a population against cumulative proportions of income the population receives, represented as a number between 0 (perfect equality) and 1 (perfect inequality). A recent estimate of the Gini coefficient for the United States was 0.39, compared to an average of 0.32 for all OECD countries (OECD, 2014). The Gini coefficient for Texas is 0.48 (U.S. Census Bureau, 2018), indicating that income inequality in Texas is notably higher than for the United States overall. Thus, garnering a more complete understanding of the role of postsecondary education in intergenerational mobility is arguably crucial for maintaining (and, ideally, improving) Texas's economic strength.

Although Texas is composed of both large urban and large rural regions, the eight academic institutions that are part of the UT System are located within small (one institution), midsize (three institutions), or large (four institutions) cities. Two of the institutions are in close proximity to the border of Mexico and serve sizable Hispanic communities. The UT System as a whole is diverse in its student population; enrollment in the Fall of 2017 was 11 percent Asian,

7 percent African-American, 40 percent Hispanic, 9 percent International, 29 percent White, and 4 percent Other/Unknown. Available data for the first generation status of UT System students is self-reported and unreliable; however, the UT System is generally believed to enroll a relatively high number of first generation students. In addition, 40 percent of undergraduates in Academic Year 2016 received a Pell Grant. Because of the diversity of the UT System both in terms of race/ethnicity and income, as well as the availability of student-level data, such as graduation status and major, this study augments previous research in intergenerational income mobility by presenting findings related to relative contributions of various factors in upward mobility.

Literature Review

A decade ago, researchers from The Pew Charitable Trusts' Economic Mobility Project (Isaacs et al., 2008) examined the status of economic mobility and its role in the American Dream, specifically, the idea that opportunities unique to the United States allow individuals to become more financially successful than their parents, regardless of family background. Following a review of research in economic mobility, Isaacs et al. concluded that, while many Americans are financially better off than their parents, the patterns of income change from generation to generation can differ greatly across various subgroups of people. Furthermore, the authors suggested that the idealized American dream of upward mobility unconstrained by the economic status of ones' parents may actually be more of a reality in other countries than it is in the United States. At the time of Isaac et al.'s (2008) review, international comparisons indicated that intergenerational economic mobility in the United States was lower than in Canada and several European countries (Corak, 2006; Jäntti et al., 2006).

Corak (2006) noted that countries with lower overall rates of intergenerational mobility tend to have a higher "private internal rate of return to tertiary education," (p.18; for a detailed

theoretical discussion of the mechanisms underlying returns to education and intergenerational mobility, see Becker, Kominers, Murphy, & Spenkuch, 2018). The United States is among the top 4 OECD countries with the highest return in terms of future earnings after obtaining a college degree (OECD, 2011; OECD, 2017b). College graduates in the United States are estimated to earn approximately 70 percent more than high school graduates (Corak, 2013, p.88). However, the gender gap in this return can be considerable and it is greater in the United States than on average in OECD countries (i.e., among baccalaureate degree recipients in the United States, women earn 70 percent of what men earn, whereas as the ratio for OECD countries is 74 percent; OECD, 2017b, p.116). In addition, within the United States the role of higher education in intergenerational mobility can differ across race/ethnic groups. For example, Bhattacharya and Mazumder (2011) found that, at the top end of the education distribution, mobility is higher for African-Americans than for Whites (p.23). Chay et al. (2014) investigated the interactions between education in general, race, gender, as well as other factors such as national region, in upward mobility among individuals born between 1945 and 1982. Their results suggest a complicated interplay amongst the studied factors.

Recent research has attempted to unpack some elements of this interplay. Torche (2016) found that the relationship between parental and adult child income can differ significantly based on the level of education. More specifically, the link is weaker for children who receive a baccalaureate degree than for those with less than a college degree. However, it is stronger for those with a graduate degree than for those whose highest level of education is a baccalaureate degree. Torche also explored gender differences in intergenerational income mobility and concluded that the relationships between parental income and child income was similar for men and women. Adult child income in this study; however, was total family income and Torche

posited that the lack of gender differences was due, at least partially, to assortative mating and household division of labor (see Gayle et al., 2015 and Torche, 2015 for reviews of literature on assortative mating and earnings). In contrast, Blanden et al. (2014) found income persistence across generations was much stronger for women than for men (i.e., for their United States sample population). Palomino et al. (2017) investigated the role of both education and race in intergenerational income mobility and found that sons' number of years of education explained 20 percent to 48 percent of income transmission, depending on the quantile of parental income. The influence of education was highest at the lower and upper income ends. In addition, the impact of race on income was estimated to be approximately 10 percent at the mean and even greater at the lower levels of the income distribution.

In another recent study, Chetty, Friedman, Saez, Turner, and Yagan (2017) examined the relationship between higher education and intergenerational income mobility. Their primary conclusions were that 1) parent income has a strong impact on access to college, with children of the highest-income families being far more likely to attend an elite college than children of lower-income families; 2) the gap in post-collegiate earnings for children from low-income families versus high-income families who had attended the same college is generally small; 3) college mobility rates are a function of the degree to which a college provides access to children from low-income families; and 4) the recent increase in college attendance by children from low-income families has occurred primarily via two-year and proprietary institutions, as opposed to four-year colleges or universities. In addition, Chetty et al. examined the correlations between a number of college characteristics and mobility rates, including the proportion of STEM majors, selectivity, graduation rate, financial indicators, enrollment size, and racial/ethnic student makeup. For bottom-to-top quintile mobility, the characteristics most highly associated

with the mobility rate were the proportion of Asian students and proportion of Hispanic students, followed by average faculty salary, enrollment size, selectivity, and STEM major share. For upper-tail mobility, the characteristics with the highest correlation with mobility rates was instructional expenditures per student, although several other characteristics were moderately or strongly related to this measure (see p.67 for all reported correlations).

A common measure of mobility is “intergenerational earnings elasticity” (IGE), determined by using OLS regression of (log) individuals’ adult income on the (log) income of their parents (e.g., Bloome, 2015; Bradley, 2017; Corak, 2006; Corak, 2013; Torche, 2011). Higher associations between parental and child adult income are considered to indicate less economic mobility, in that the income of the adult child more strongly reflects the financial status of the household in which one grew up. Several researchers (see, for example, Blanden, 2013; Corak, 2013; OECD, 2014; Russell Sage Foundation, 2016) have noted that countries with lower intergenerational earnings mobility tend to have higher income inequality, as well as greater inequality of opportunity (Brunori, Ferreira, & Peragine, 2013). Among OECD countries, the United States exhibits the fourth highest inequality of income - the average income of the richest 10 percent of the population is 16 times larger than that of the poorest 10 percent (OECD, 2014, p.2) – and is among the bottom five OECD countries in terms of intergenerational earnings mobility. Although cross-country comparisons indicate a negative correlation between income inequality and mobility, Bloome (2015) argued that this relationship may not exist when comparisons are made across cohorts or states within the United States, providing evidence, for example, that states with higher levels of income inequality do not display lower family income mobility.

There are several reasons why Bloome's results may differ from the work of investigators making international mobility comparisons, only three of which will be noted here. First, much of the cross-national research on economic mobility has focused on the IGE between fathers' income and sons' income (Blanden, 2013), whereas Bloome employed total family income. Evidence suggests the relationship between total family income and son's earnings is stronger than that between father's income and son's earnings (Moonen & van den Brakel, 2011; Torche, 2015) and that, in general, using total family income, rather than the income of an individual parent, allows a fuller picture of intergenerational earnings transmission (Gayle et al., 2015). Second, some of Bloome's model variants (i.e., random and fixed effects models) included combinations of measures of parental gender, education, age, marital status, race, child gender, family size, and demographic and economic attributes of the states in which families resided. Cross-country estimates of mobility generally do not control for many additional factors that can potentially mediate generation-to-generation income persistence, due to data limitations. Third, as Bloome noted, the nature of the relationship between inequality and mobility may differ across countries and the underlying factors behind this general association may not apply to a given specific country.

Although IGE has long been a primary method of choice in intergenerational mobility research, the potential disadvantages of this method are well-documented (see, for example, Black & Devereaux, 2011; Blanden, 2013; Chetty et al., 2014; Davis & Mazumder, 2017; Gayle et al., 2015; Lee & Solon, 2009; Mitnik, Bryant, Weber, & Grusky, 2015; Moonen & van den Brakel, 2011; Palomino et al., 2017; Perez-Arce, Amaral, Huang, & Price, 2016; Torche, 2015). A review of the methodological issues underlying the IGE approach for measuring income mobility is beyond the scope of this paper. However, critiques of the IGE model from the

above and other researchers include biases that result from measurement error when 1) taking parental income from a single year (recommended solutions are generally to average parental income from five or more years to obtain an estimate of permanent earnings); 2) using income for parents and children when they are at different stages in the life cycle (alleviated when the dependent and independent income variables are measured when parent and adult child are of similar ages); employing income measurements taken at early career or late life cycle stages (suggestions for the ideal age to measure income vary, but tend to indicate between the early 30s to mid-40s – e.g., Blanden, 2013, p.40). An additional concern about IGE calculations is that they do not include negative or zero incomes and, therefore cannot be used to construct an IGE for an entire population of a country, for example (Moonen & van den Brakel, 2011). Furthermore, the IGE does not allow comparisons of subgroups of individuals within an entire population (Bhattacharya & Mazumder, 2011). Finally, IGE inherently assumes a linear relationship between parent and child income, but there is increasing evidence that the correlation between parent and child income varies at different points of the income distribution (Chetty et al., 2014; Greenstone et al., 2013; Isaacs et al., 2008; Mazumder, 2014; Mitnik et al., 2015; Moonen & van den Brakel, 2011; Palomino et al., 2017; Torche, 2015).

In effort to overcome the limitations of traditional IGE calculations, alternative measurements of intergenerational mobility have been utilized, including transition matrices (e.g., Akee, Jones, & Porter, 2017; Moonen & van den Brakel, 2011), dollar-weighted IGE (Mitnik et al., 2015), logit models (e.g., Moonen & van den Brakel, 2011; Morgan & Kim, 2006), nonparametric methods (e.g., Bhattacharya & Mazumder, 2011; Mazumder, 2014), quantile regression (e.g., Chay et al., 2014; Palomino et al., 2017), semi-parametric estimates (e.g., Carneiro, Garcia, Salvanes, & Tominey, 2015), and rank-rank slopes (e.g., Chetty et al.,

2014; Chetty, Hendren, Jones, & Porter, 2018; Davis & Mazumder, 2018; Mazumder, 2015).

While none of these methods solves all of the potential limitations of the traditional IGE measure of intergenerational mobility, they provide additional tools for mobility researchers and, depending on the research question, may be a better alternative to the IGE.

For example, Chetty, Hendren, Kline & Saez's (2014) use of rank-rank slopes provided the investigators a method for handling the nonlinear pattern of their income data, as well as zero income data. In this study, Chetty and his colleagues ranked both adult children on their income relative to other individuals in their birth cohort and parents on their income relative to other parents in those cohorts. They then determined the correlation between the child and parent rankings and found that, while the relationship of the log values of child and parent income was not linear, the relationship between mean child and parent ranks was (pp.1-2). Subsequently, they examined whether or not differences in intergenerational mobility could be found across geographic areas within the United States. The results of their study provided important insight into the status of the American Dream, in terms of the opportunity for upward mobility – intergenerational transmission of income can vary greatly across the country, depending on the geographic area in which a child grows up, whether it be national region, state, or commuting zone. Similar to Corak (2013) and, in contrast to the work by Bloome (2015), Chetty et al. found that one of the characteristics associated with high mobility areas was low income inequality.

This study is designed to expand on the work by Chetty et al. (2017) by using additional demographic and educational data available for individual students, rather than college characteristics, to determine mobility rates for subpopulations of former enrollees of institutions within the UT System. More specifically, it describes intergenerational income mobility rates on the basis of college major, race/ethnicity, gender, and completion status. Several recent studies of

the earnings outcomes of college graduates have established that the economic return for some majors is greater than for others (Carnevale, Fasules, Bond Huie, & Troutman, 2017; Carnevale, Cheah, & Hanson, 2015; Carnevale, Strohl, & Melton, 2011; Cataldi, Siegel, Shepherd, & Cooney, 2014; Hershbein, Harris, & Kearney, 2014; Hershbein & Kearney, 2014; Humphreys & Kelly, 2014; Julian, 2012; Ma, Pender, & Welch, 2016; Schneider, 2016). The goal here is to bridge the work in earnings by major and intergenerational mobility by demonstrating that, even though STEM majors tend to earn more than non-STEM majors, choosing a non-STEM path has an important contribution to upward mobility – to make this point, mobility rates are calculated for students who have chosen both pathways. Similarly, the study below adds to existing knowledge about the role of race/ethnicity and gender in intergenerational mobility, which suggest that mobility rates for African-Americans and Hispanics, for example, are lower in the United States overall than for Whites and that the issues behind the mobility rates for daughters versus sons are complex and deserving of further investigation (Bhattacharya & Mazumder, 2011; Blanden, 2013; Blanden et al., 2014; Bloome & Western, 2011; Causa & Johansson, 2010; Chetty et al., 2018; Davis & Mazumder, 2018; Gayle et al., 2015; Isaacs et al., 2008; Lee & Solon, 2009; Mazumder, 2014; Mitnik et al., 2015; Moonen & van den Brakel, 2011; OECD, 2011; OECD, 2017b; The Pew Charitable Trusts, 2015).

As stated previously, this investigation differs from Chetty et al.'s (2017) exploration of the association between race/ethnicity and mobility, in that specific demographic characteristics are directly tied to individual students, rather than college-level proportions. In addition, the availability of degree information in this study allows for comparisons of the effect of college completion versus attendance on mobility rates. Institution type and financial aid information are included in the analyses as well. Lastly, while the primary focus of Chetty et al.'s college

mobility report cards was bottom-to-top quintile mobility rates, the investigation below considers mobility across the income spectrum, seeking to further explore the degree to which the reported “stickiness” of mobility for American children in the bottom and top income quintiles (e.g., Isaacs et al., 2008; Russell Sage Foundation, 2016) applies when education is taken into consideration.

Method

Data and Population

The UT System conducted an intergenerational mobility analysis on a base data set of undergraduate students who had exited a UT System academic institution between Academic Year 2005 and 2012. Foreign students were excluded from the analysis. Enrollment and degree information from the Texas Higher Education Coordinating Board was used to identify whether or not a student had earned a baccalaureate degree from a UT System institution before exiting. The base data set included 287,960 observations. The key variables used to calculate intergenerational mobility were student post-collegiate earnings and parental household income measured while students were attending college. Unemployment Insurance (UI) earnings for individuals who were working in Texas up to fifteen years after leaving a UT System academic institution are available from the Texas Workforce Commission. For the purpose of this investigation, earnings at the fifth year post-exit were utilized, as previous longitudinal analysis of the UT System wage data has indicated that the cumulative effect of post-collegiate work experience (in terms of years) equals or surpasses the effect of baccalaureate degree completion within six years of exiting college. Thus, analyses in this investigation focus on the period of time in which a baccalaureate degree is most likely to influence earnings, even though earnings themselves may not be stabilized until later in life, particularly for students who chose to pursue

graduate degrees. UI fifth-year earnings records were available for 201,772 students in the base data set. National Student Clearinghouse data was incorporated to identify students who had received an additional degree within five years of receiving their baccalaureate degree from the UT System, as well as to identify students who were enrolled in a graduate or other program at the time student income was measured.

Parent income data was obtained from Texas Higher Education Coordinating Board's financial aid database, which contains financial aid and demographic information for each student who enrolled and completed the Free Application for Federal Student Aid (FAFSA) or Texas Application for State Financial Aid (TASFA). Due to the way income was reported by some institutions for 2005 through 2008, parental household income for all years includes any student income that was reported as part of the financial need analysis. While student income in this study reflects single-person earnings, parental income is the adjusted gross income (AGI) at the household level and, therefore, could represent adjusted earnings for either one or two parents, as well as the student. FADs data can contain multiple years of adjusted gross income for a student's family; for the purpose of reflecting the social status of parents in this investigation, the earliest year of parental household income available was utilized. Household income data was available for 135,149 students in the base data set. The study sample, or core data set, was limited to students who had both UI earnings data and parental household AGI obtained from the FAFSA or TASFA and comprised 98,199 observations. Because students with financial aid data are a subgroup of the overall student population, a descriptive analysis was conducted to determine the degree to which the core dataset represented the student population as a whole on the basis of race/ethnicity.

Table 1

Race/Ethnicity Composition of Exiting Student Body (Base Data Set), Students Who Received Financial Aid, and Study Population (Core Data Set)

Race/Ethnicity	Base Data Set		Base Receiving Financial Aid		Core Data Set	
	No.	%	No.	%	No.	%
African American	19,879	6.9	10,478	7.9	7,972	8.1
Asian	23,890	8.3	12,702	9.6	8,316	8.5
Hispanic	119,053	41.3	64,673	48.9	50,175	51.1
Other Races	6,046	2.1	1,882	1.4	1,335	1.4
White	119,092	41.4	42,546	32.2	30,401	31.0
Total	287,960	100.0	132,281	100.0	98,199	100.0

Table 1 indicates that Hispanic students were overrepresented in the study sample by 9.8%, while White students were underrepresented by 10.4%. A similar comparison for gender indicated that the proportion of males and females in the study sample mirrored the proportion in the general student population (approximately 55 percent female and 45 percent male in both cases).

Measures

Consistent with several previous intergenerational mobility investigations (e.g., Chetty et al., 2014; Palomino et al., 2017; Torche, 2015), initial analysis indicated that the relationship between parental household income and student income in the study sample was highly nonlinear, whether in actual values or log-transformed values. In addition, in this study the income data between parents and students are measured at different ages and from different data sources, which would result in large variation for IGE estimates. Following the similar procedure to Chetty et al. (2014), this investigation utilizes an alternative measure of intergenerational mobility, the rank-rank slope, which measures the association between parent ranks in parent income distribution and student ranks in student earnings distribution and is much more robust

across specifications, compared to the IGE measure. Unlike the log-log joint distribution, the rank-rank relationship in the sample data is very linear. More specifically, in the base data set, students' percentile ranks R_i are defined based on their positions in the student earnings distribution, after removing missing wage records.¹ Similarly, the percentile ranks P_i of parents are defined based on their positions in the parent income distribution. Rank-rank slope is estimated by using OLS to regress mean student income ranks on parent income ranks.

$$R_i = \alpha + \beta P_i + \varepsilon$$

In this equation, P_i is the parent rank, R_i is the mean students rank, and the estimated coefficient β is the rank-rank slope. The rank-rank slope measures relative mobility, which represents the difference in student earnings between students from top income families and bottom income families. A smaller β indicates higher relative mobility, because the difference in student earnings between those with high and low parent income is small. The intercept α is the expected mean percentile rank for students from families at the bottom of income distribution.

Another measure analyzed in the study is the conditional quintile transition matrix, which also provides information about relative mobility. For example, if parents were in the bottom quintile, but students move into the second quintile, then upward mobility is experienced. Each entry in the matrix depicts the percentage of students from at a given quintile who end up at a different quintile five years after graduating with a baccalaureate degree. The quintile transition matrix provides a simple, but clear, picture of how many quintiles students move up, or down, compared to the quintiles of their parents' household during the time the student was in college. First, bar charts are utilized to illustrate mobility transition by completion status. Second, for

¹ Wage records for former students with a value of zero were also excluded, as the UI Records Center data did not allow determination of when these values represented true zero earnings versus missing data. Parental income did include zero adjusted gross income.

students who earned a degree, the variation in intergenerational quintile mobility is identified and illustrated in bar charts by gender, STEM² or non-STEM majors, and race/ethnicity (specifically, whether or not the student is a historically underrepresented minority³). Finally, results from logistic regression are presented to augment the interpretation of how these characteristics contribute to intergenerational mobility.

Results

As indicated in Table 2 and Figure 1, there is a very strong relationship between the relative household income of parents while students are attending college and student relative earnings five years' post-exit. The rank-rank slope of completers and non-completers is similar, with completers generally exhibiting higher earnings than non-completers, however. Regressing student mean percentile ranks on parental household percentile ranks indicated that, controlling for parent income, completers were predicted to earn 23 percent more relatively than non-completers.

² STEM majors were defined as programs in the areas of natural resources and conservation, engineering, biology and life sciences, health, physical sciences, computers, statistics, and mathematics.

³ Underrepresented minority (URM) students were defined as individuals who self-identified as African American (including multiracial), Hawaiian/Pacific Islander, Hispanic, or Native American. Non-underrepresented minority (Non-URM) students were self-identified as Asian or White.

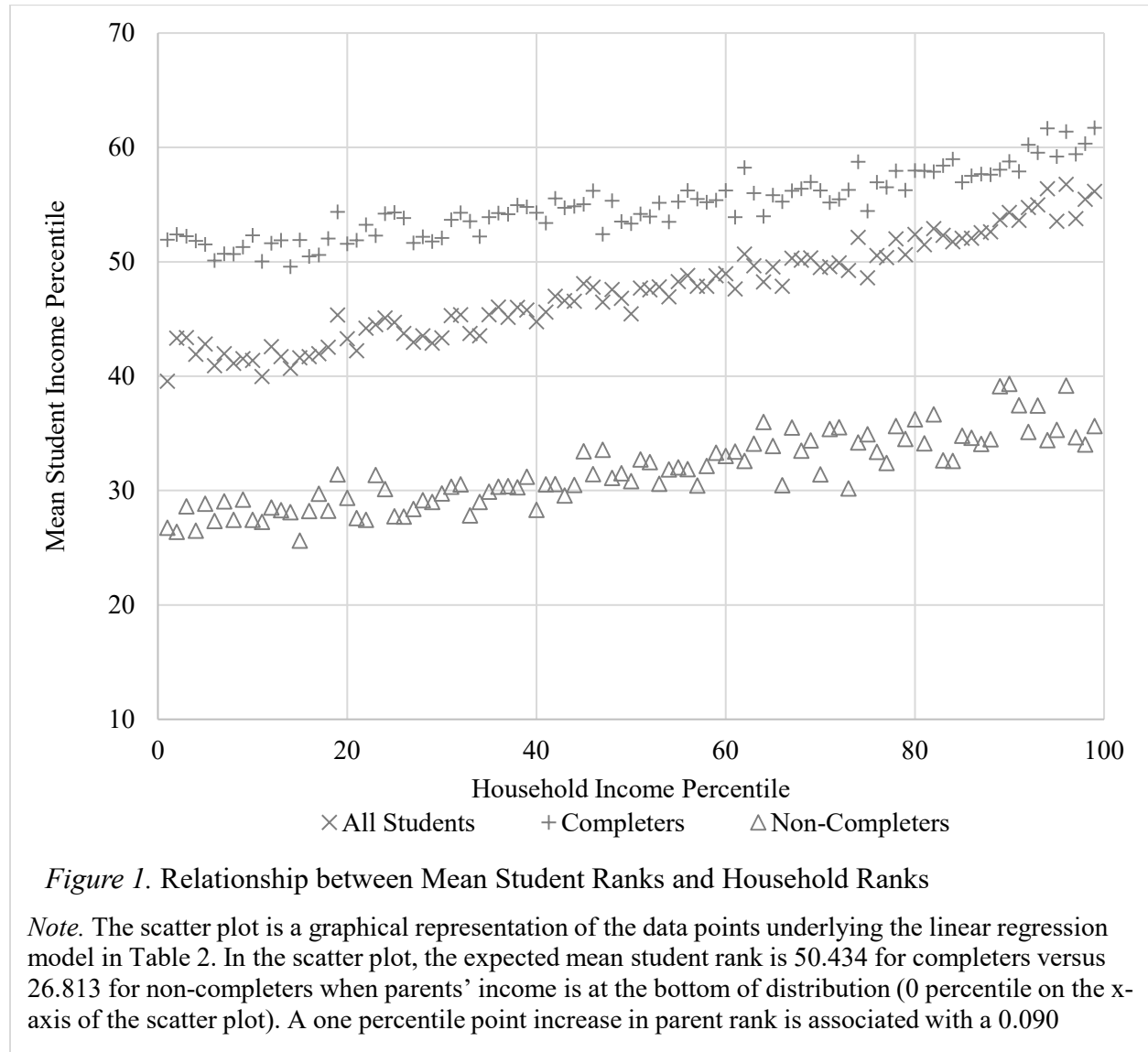
Table 2

Coefficients from Linear Regression Models (LRM) for Mean Student Ranks and Household Ranks

	LRM: All Students	LRM: Completers	LRM: Non-Completers
Intercept	40.177* (0.219)	50.434* (0.232)	26.813* (0.297)
Slope	0.145* (0.004)	0.090* (0.004)	0.097* (0.005)
<i>R</i> ²	0.938	0.837	0.786
<i>N</i>	98,199	66,396	31,803

Note. The expected mean student rank is 50.434 for completers versus 26.813 for non-completers when parents' income is at the bottom of distribution. A one percentile point increase in parent rank is associated with a 0.09 percentile point increase for completers vs 0.097 for non-completers in a student income rank on average. The slope for completers is smaller, which indicates that completers have higher relative mobility.

* $p < .05$. ** $p < .01$. *** $p < .0001$.



For both completers and non-completers, relative mobility is highest for students from families at the bottom quintile. Among graduates, 84.9 percent of former students in the bottom quintile moved into a higher quintile five years after leaving school, while for non-graduates 58.5 percent did the same (see Figure 2). Completers from the second quintile were also likely to display upward mobility, with 69.4 percent moving up one or more quintile in income. Non-completers from the second quintile displayed a more modest trend of upward mobility, where a little more than a quarter saw an increase in income, compared to their parents. In general, the

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evidence indicates that attending a UT System institution contributes to intergenerational mobility for a large number of former students, even non-graduates, but the boost is certainly greater for those individuals who obtained their baccalaureate degree. Even among completers from the third quintile, nearly half experienced upward mobility relative to their parents within five years of graduation.

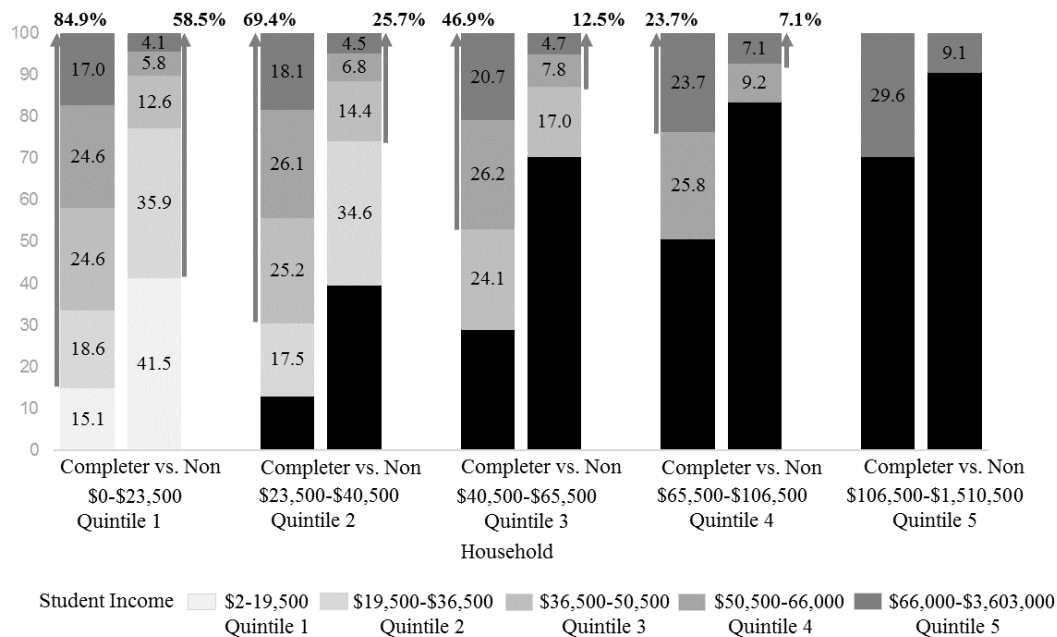


Figure 2. Intergenerational Income Mobility by Household Income for Completers and Non-Completers

Note. Income ranges are rounded to the nearest 500 dollars. Student income quintiles are distinguished by shades of gray, with lighter shades of gray representing lower quintiles and darker shades higher quintiles. The block with the lightest shade represents the percentage of students who remained in the same quintile as their parental household. Colored blocks above the “same quintile” block demonstrate upward mobility, also denoted with arrows, compared to parental household quintile. Black blocks represent downward mobility. For students in quintiles 1 through 4, a higher proportion of completers were upwardly mobile than non-completers.

To verify the importance of college completion on upward mobility, a logistic regression was run with completion status, student gender, student race/ethnicity (underrepresented minority or not underrepresented minority), student major (STEM or Non-STEM), parental household income, institution type, and type of financial aid received as explanatory variables for whether or not a student moved up at least one quintile compared to their parents. Also

included in the model were whether or not students were enrolled in any institution five years after they received their baccalaureate degree and whether or not they had received an additional degree when income was measured. The results indicate that, after parental household income, the strongest predictor of upward mobility was whether or not a student had graduated from a UT System institution (and was not enrolled in school when income was measured), with completers who had not returned to school for an additional degree almost six times more likely to move up one or more quintile than non-completers, when controlling for gender, race/ethnicity, type of major, familial income, institution type, and financial aid type (Table 3). Baccalaureate recipients who had received additional degrees were even more likely to have moved up one or more quintiles than their parents. In addition, completers enrolled in school five years after receiving their baccalaureate degree were three times more likely to demonstrate upward income mobility than non-completers.

Major was the second most important factor in upward mobility; STEM majors were 70 percent more likely to move up 1+ quintile than Non-STEM majors. The results of other potential influences of income mobility will be discussed in the context of a second logistic regression model, in which only students who completed their baccalaureate program were included in the analysis.

Table 3

Odds Ratios from Logistic Regression Results for All Exiting Students

		<i>Odds Ratio</i>
Parent Income	Q1	26.972***
Parent Income	Q2	8.375***
Parent Income	Q3	3.047***
Status	Completers – In School	3.018***
Status	Completers – With Additional Degree and Not in School	8.477***
Status	Completers – Without Additional Degree and Not in School	5.976***
URM	URM	0.836***
Gender	Male	1.582***
STEM Status	STEM	1.699***
School Type	High Selectivity/Large or Midsize City	1.260***
School Type	Medium Selectivity/Large City	1.023
Aid Type	Received a Grant or Scholarship	0.969
Aid Type	Received a Loan	1.157***
Aid Type	Received Work Study	0.980
Intercept		0.033***
<i>N</i>		74,009

Note. The biggest factor in upward mobility is parental income, with students in the lowest income category most likely to move up 1+ quintile. Completing a baccalaureate program is the second largest factor, particularly for students who later obtained an additional degree. Underrepresented minority (URM) students are less likely to experience upward mobility within five years, compared to Non-URM students. Males and former students who had been STEM majors are more likely to have a higher relative income, in comparison to their parents, than are females and Non-STEM majors, respectively. Students from high selectivity institutions are more likely to be upward mobile than students from medium selectivity institutions, as are students who received a loan, compared to those who did not receive a loan.

* $p < .05$. ** $p < .01$. *** $p < .0001$.

As indicated in Table 4, when examining upward mobility for only students who completed their degree programs, STEM majors are over twice as likely than Non-STEM majors to have higher relative incomes than their parents, controlling for student demographic characteristics, institution type, and financial aid type.

Table 4

Odds Ratios from Logistic Regression Results for Students Who Completed Their Baccalaureate Degree

		<i>Odds Ratio</i>
Parent Income	Q1	24.161***
Parent Income	Q2	9.509***
Parent Income	Q3	3.230***
Status	Completers – In School	0.493***
Status	Completers – With Additional Degree and Not in School	1.397***
URM	URM	0.861***
Gender	Male	1.502***
STEM Status	STEM	2.109***
School Type	High Selectivity/Large or Midsize City	1.245***
School Type	Medium Selectivity/Large City	1.011
Aid Type	Received a Grant or Scholarship	1.003
Aid Type	Received a Loan	1.086**
Aid Type	Received Work Study	0.940*
Intercept		0.190***
<i>N</i>		51,193

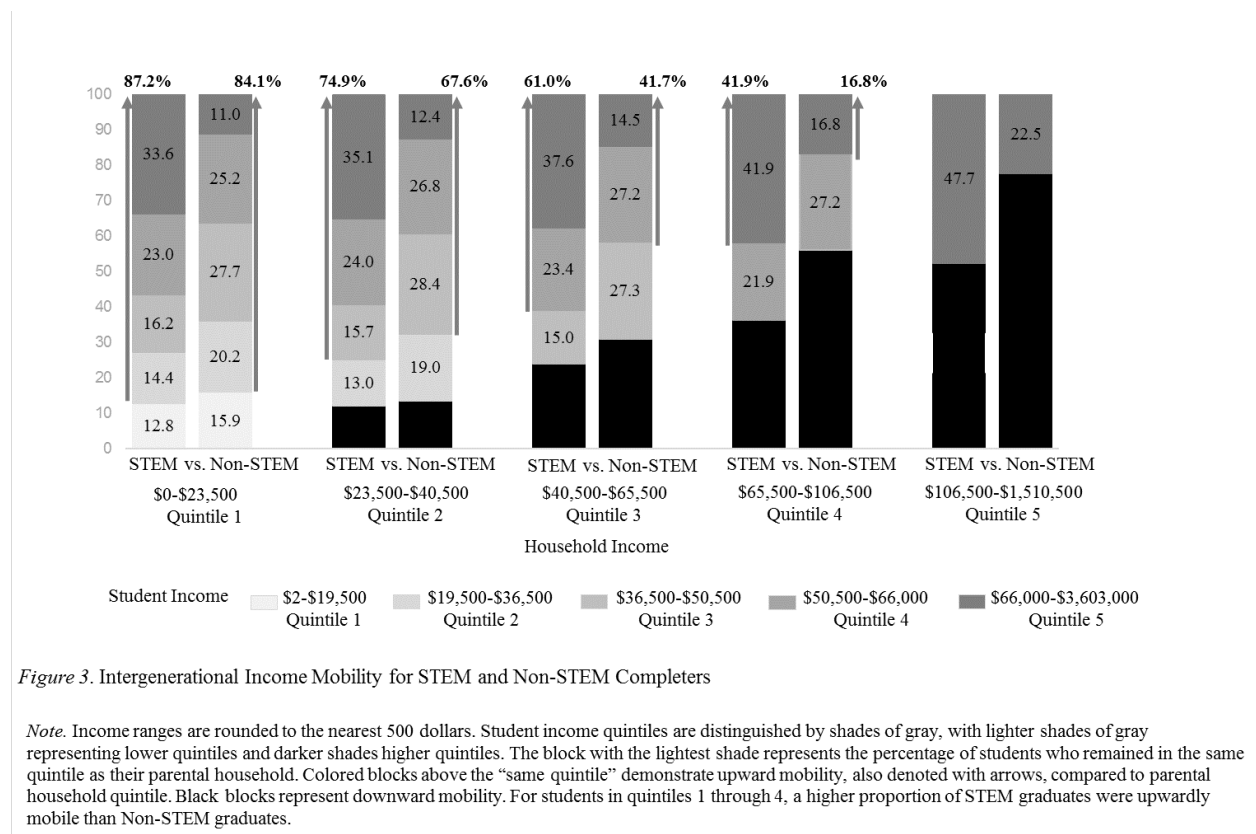
Note. For baccalaureate recipients, the biggest factor in upward mobility is parental income, with students in the lowest income category most likely to move up 1+ quintile, compared to their parents' income. Graduating with a STEM degree is the second largest factor. Students who were pursuing additional education when income was measured had a decreased likelihood of demonstrating upward mobility than students who were not in school and who did not have an additional degree. Having completed an additional degree was associated with an increased likelihood of upward income mobility. Underrepresented minority (URM) students are less likely to experience upward mobility within five years, compared to Non-URM students. Males are more likely to have a higher relative income, in comparison to their parents, than are females. Students from high selectivity institutions are more likely to be upward mobile than students from medium selectivity institutions, as are students who received a loan, compared to those who did not receive a loan.

* $p < .05$. ** $p < .01$. *** $p < .0001$.

Although majoring in a STEM field increases the likelihood of intergenerational mobility, Figure 3 demonstrates that Non-STEM majors who graduate also see a clear boost in their earnings, relative to their parents. In fact, for those students from families in the bottom quintile, the overall upward mobility rate is nearly the same for STEM and Non-STEM graduates

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(87.2 percent and 84.1 percent, respectively) and two-thirds of Non-STEM graduates from the second quintile have moved up at least one quintile within 5 years of receiving their degree. Similarly, 41.7 percent of Non-STEM graduates from the third quintile have comparatively higher earnings than their parents had when their children were attending college. Nevertheless, consideration of the patterns within a given quintile indicate that STEM majors are more likely than Non-STEM majors to move up more than two quintiles from their parents' relative position.



As indicated above in Table 4, among the characteristics examined here, gender is a strong predictor of intergenerational mobility for students who had attended a UT System institution, with males graduates 50 percent more likely than female graduates to be upwardly mobile after controlling for in-school status, STEM vs. Non-STEM major, race/ethnicity, parent income, institution type, and financial aid type. However, as was the case with mobility rates

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based on broad areas of study, gender differences in general are greater for individuals whose parents are among higher income quintiles than the lowest quintile (Figure 4). For example, for male and female graduates from the bottom quintile, the percentage who moved up 1+ quintile was 85.8 and 84.4, respectively, whereas the percentage for those with parental income in the third quintile were 54.3 for males and 41.9 for females. Among graduates from the fourth quintile, over twice as many males than females displayed upward mobility. Within-quintile comparisons indicate that male graduates more frequently move up to the fourth and fifth quintile than female graduates.

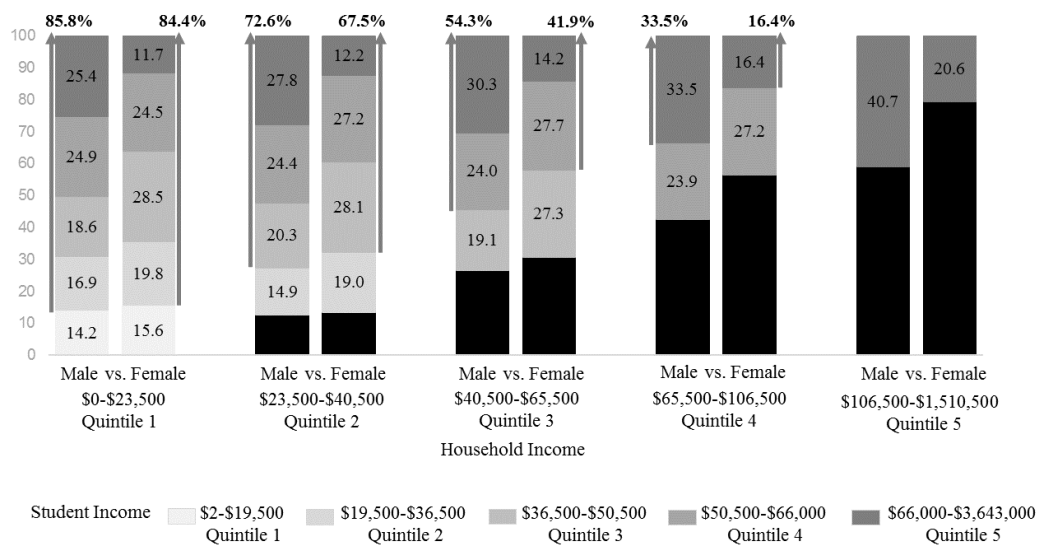


Figure 4. Intergenerational Income Mobility for Male and Female Completers

Note. Income ranges are rounded to the nearest 500 dollars. Student income quintiles are distinguished by shades of gray, with lighter shades of gray representing lower quintiles and darker shades higher quintiles. The block with the lightest shade represents the percentage of students who remained in the same quintile as their parental household. Colored blocks above the “same quintile” demonstrate upward mobility, also denoted with arrows, compared to parental household quintile. Black blocks represent downward mobility. For students in quintiles 1 through 4, a higher proportion of males graduates were upwardly mobile than female graduates.

Another characteristic examined in this study for its role in intergenerational mobility was race/ethnicity. The logistic regression results presented in Tables 3 and 4 indicated that, when other important factors were controlled for, underrepresented minority (URM) students

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were less likely than Non-URM students to move up one or more earnings quintile, relative to their parents. In the case of students who graduated (Table 4), URM individuals were 14 percent less likely to experience upward mobility within 5 years of exiting college than were Non-URM students. The transition matrix in Figure 5 suggests that, for individuals from the bottom two income quintiles, the difference in overall mobility rates of Non-URM and URM students is small.

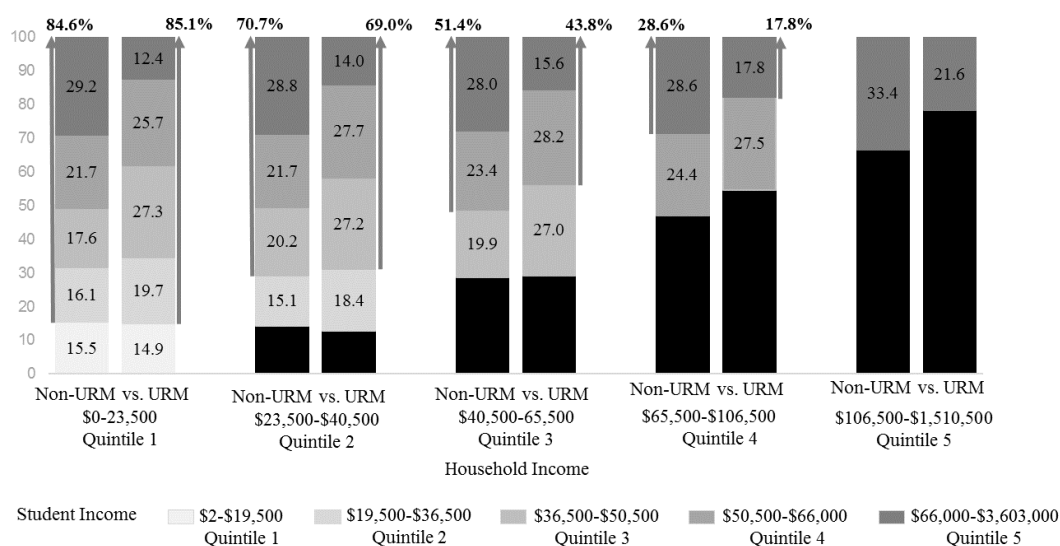


Figure 5. Intergenerational Income Mobility for Non-URM and URM Completers

Note. Income ranges are rounded to the nearest 500 dollars. Student income quintiles are distinguished by shades of gray, with lighter shades of gray representing lower quintiles and darker shades higher quintiles. The block with the lightest shade represents the percentage of students who remained in the same quintile as their parental household. Colored blocks above the “same quintile” demonstrate upward mobility, also denoted with arrows, compared to parental household quintile. Black blocks represent downward mobility. For students in quintiles 1 through 4, a higher proportion of non-underrepresented minority graduates were upwardly mobile than underrepresented minority graduates.

Although transition matrix bar charts are useful for displaying changes in income over time in a simple manner, they can conceal important information about group differences in a population. For example, Figure 5 does not take into account that URM students are more heavily represented in the bottom two income quintiles, while Non-URM students compose a greater proportion of the top two income quintiles (Table 5). In this study, Non-URM individuals

are more likely than URM individuals to see a mobility benefit from higher education and this difference is the greatest for the fourth quintile, in which 68.6 percent of the population is Non-URM. The pattern of higher mobility rates for Non-URM students holds true in logistic regression analyses both when other factors, such as gender and major, are taken into consideration and when they are not.

Table 5

Proportion of Non-URM and URM Students in Each Parental Household Income Quintile

Parental Quintile	Non-URM	URM
1	27.7%	72.4%
2	27.9%	72.1%
3	40.8%	59.2%
4	54.7%	45.3%
5	68.6%	31.4%
All	45.2%	54.8%

Other factors of interest in the logistic regression analyses were the influence on in-school status, institution type, and financial aid type on this investigation’s measurement of upward income mobility. When focusing only on students who received their bachelor’s degree (Table 4), completers who were pursuing additional education at the time income was measured were 51 percent less likely to have higher relative earnings than their parental household while the student was an undergraduate, compared to completers who were not enrolled in college five years after receiving the baccalaureate degree. In contrast, completers who received an additional degree or certification and were not currently in school were 40 percent more likely than completers who had not obtained an additional degree or certificate to have moved up 1+ quintile, relative to their parents.

Institutions at the UT System were placed into three categories when entered into the model, based of two characteristics, admissions selectivity and the size of the city in which they were located. The three categories were High Selectivity/Large or Midsize City (two institutions), Medium Selectivity/Large City (three institutions), Medium Selectivity/Midsize or Small City (three institutions). As demonstrated in Table 6, there is a notable association between institution type and parental household income, where over half of the students who attended high selectivity institutions were from households in the highest two income quintiles, approximately 45 percent of the students in the Medium Selectivity/Large City category from were households in the third and fourth quintile, and more than 50 percent of the students in the Medium Selectivity/Midsize or Small City category were from households in the lowest two income quintiles.

Table 6

Parental Quintile Distribution for Types of Institution

Parental Quintile	High Selectivity / Large or Midsize City	Medium Selectivity / Large City	Medium Selectivity / Midsize or Small City
1	13.0%	16.0%	26.3%
2	13.2%	19.6%	28.5%
3	18.6%	22.5%	20.3%
4	23.0%	22.6%	15.5%
5	32.3%	19.3%	9.5%
All	100.0%	100.0%	100.0%

Among graduates (Table 4), students who had attended institutions with high admissions selectivity and that were located in a midsize or large city were 25 percent more likely to demonstrate upward mobility than students who had attended institutions with medium selectivity and that were located in midsize or small cities, controlling for parental income, major, gender, race/ethnicity, and financial aid type. For the medium selectivity institutions,

comparisons on the city size were not statistically significant. The logistic regression results suggest that differences in upward mobility based on institution attended are largely accounted for by the parental income terms.

The results for the effect of type of financial aid received while pursuing a baccalaureate degree were also mixed. While graduates who had received work study aid were less likely to move up one or more income quintile than those who had not, graduates who had received student loans were 9 percent more likely to move upward. Receiving a grant or scholarship neither increased nor decreased the likelihood of upward mobility. However, it is possible that differences exist among students who received need-based versus merit-based grant and scholarship aid. In order to avoid collinearity between financial aid type and parental income in the logistic regression models, grant and scholarship aid with different award criteria were combined into a single category.

Discussion

In the section above, descriptive and inferential results pertaining to the intergenerational mobility of former UT System students were presented. The primary focus was to explore the degree to which these students demonstrated higher relative earnings than their parents five years after exiting a UT System institution. The decision to place the emphasis on upward mobility, rather than also consider apparent downward mobility, for example, was primarily a result of the limitations of the data available. Parental household income was measured when students first applied for financial aid, while student income was measured five years after they left a baccalaureate program. Thus, earnings for parents were gathered at later career stages than were earnings for their children. As such, the mobility rates presented here are likely an underestimate of the mobility that would be seen if income for both populations were measured at similar

points in the life cycle. In addition, parental income could represent earnings from one to three people, while child income is individual earnings. “Downward” trends, therefore, may merely reflect the fact that the individual income of a child is less than the combined income of the parental household.

The results of this study indicate that many former UT System students demonstrate increased relative income mobility compared to their parents’ household as soon as five years after leaving college. This is particularly true for students from lower income families. While completing a degree is not necessarily mandatory for experiencing an earnings boost, receiving a baccalaureate degree clearly increases the likelihood of upward mobility. Completion itself, however, is not the only factor that affects intergenerational changes in financial status. Choice of major has a significant role in mediating income persistence across generations, with STEM majors more likely than Non-STEM majors to move up one or more income quintile, in comparison to their parents. However, many Non-STEM graduates also see a financial lift and, if two of the goals for attending college are discovering one’s academic passion and improving on the relative socioeconomic position of the family born into, many UT System graduates are arguably achieving those goals, regardless of their choice of major.

Differences in intergenerational mobility are found on the basis of gender, with females demonstrating more income persistence than males. This finding is consistent with some prior work, such as that by Blanden et al. (2014), where the researchers discovered that income persistence across generations in the United States is greater for women than for men, even when education is taken into consideration. However, other investigations have resulted in disparate conclusions regarding gender differences in cross-generational mobility and researchers have

argued that some of the factors that contribute to mobility may differ for men and women (for example, see discussions by Isaacs et al., 2008; Gayle et al., 2015; Mitnik et al., 2015).

Similarly, race/ethnicity has a complicated role in intergenerational mobility. In general, research in the United States has indicated that mobility rates for African-Americans and Hispanics are lower than for Whites (Bhattacharya and Mazumder, 2011; Chetty et al., 2018; Davis and Mazumder, 2018; Mazumder, 2014). In the analysis presented here for college graduates, underrepresented minority students also experienced overall lower rates of intergenerational upward mobility overall than did non-underrepresented minority students. However, at the lowest income levels, the difference in mobility rates is quite small. This pattern is at least partially consistent with research conducted by Palomino et al. (2017), which indicated that children's total education is a mediating factor for the influence of race/ethnicity on income persistence, particularly for individuals from households the lowest and highest ends of the income distribution.

Overall, the results of this investigation provide only partial evidence in support of previous findings indicating that American children from the bottom and top quintiles have difficulty achieving upward mobility in comparison to their parents (e.g., Isaacs et al., 2008; Russell Sage Foundation, 2016). In fact, the relative economic status for students from the bottom quintile improved for 86 percent of UT System graduates and nearly 60 percent of non-graduates, a finding that is also consistent with Palomino et al.'s (2017) investigation. In contrast, only 24 percent of graduates from the fourth quintile displayed higher relative earnings compared to their parental household and the relative earnings of approximately 70 percent of students from the fifth quintile were lower compared to their parents. It is important to note again, however, that this result may be an outgrowth of 1) the different times in the lifecycle that

child versus parental household income was measured (for example, 11 percent of the UT System baccalaureate recipients were in the process of continuing their education at the time of measurement) or 2) the fact that student income is always for one individual, but parental household income could be for one to three individuals.

In general, this initial intergenerational mobility study at the UT System provides clear evidence that receiving a bachelor's degree contributes to upward intergenerational mobility for many individuals from low- and middle-income families and that this benefit is seen as early as five years after completing college. However, the results presented have important implications for the role of higher education in Texas's economy. When parental income, degree completion, and other factors are accounted for, female former students experienced lower rates of upward income mobility than did male students. Furthermore, students from an underrepresented minority group were less likely overall to have a higher relative income compared to their parents than were non-underrepresented minority students. As the Hispanic population, in particular, of Texas is expected to more than double by 2050, it is crucial to not only enroll and graduate more Hispanic students from lower income families, but to also ensure that Hispanic (and other underrepresented minority) students from middle-income families achieve the same level of economic benefit from degree completion as non-underrepresented minority students do. Future research will investigate the potential ways that gender and race/ethnicity interact in mobility trends, as well as explore the differences in mobility rates for the most common majors at UT System academic institutions.

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