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Reducing Undergraduate Debt to Increase Latina and Latino Participation in STEM Professions

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This report was written by Dr. Alicia C. Dowd, Associate Professor and Co-Director of the Center for Urban Education (CUE), and Dr. Lindsey E. Malcom, Assistant Professor at George Washington University. The authors wish to acknowledge Emily Ogle and Cecilia Santiago for their valuable research and editorial support.

The Center for Urban Education is conducting a study funded by the National Science Foundation (Grant No. 0653280) to determine practical ways of increasing Latinos' access to and success in STEM fields, with Dr. Alicia C. Dowd as Principal Investigator and Dr. Estela Mara Bensimon as Co-Principal Investigator. Through this study, CUE is examining the features of exemplary STEM policies and programs to identify ways for institutions — both Hispanic-Serving Institutions (HSIs) as designated by the U.S. Department of Education, and non-Hispanic Serving — to increase the number of Latino STEM graduates.

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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In Fall 2010, the National Academies¹ issued an urgent call to action to address the ongoing underrepresentation of African Americans, Hispanics, Native Americans, and other racial-ethnic groups in science and engineering (S&E) fields². Calling for a comprehensive national effort to expand diversity, the *Talent at the Crossroads* report (NAS, 2011) emphasized that the effort “to sustain and strengthen S&E must...draw on the talents of all Americans, including those minorities...who embody a vastly underused resource and a lost opportunity for meeting our nation’s technology needs” (p.1). Recognizing diversity as an asset, it called for a near-term goal of doubling the number of underrepresented students earning science, technology, engineering, and mathematics (STEM) degrees. The *Crossroads* report highlighted the fact that achieving parity in STEM degree completion in the long term will require a tripling or quadrupling of underrepresented groups in some fields.

These dramatic increases of underrepresented racial-ethnic groups in STEM are necessary not only to grow a strong, talented, and innovative science and technology workforce, but to ensure democratic rights, civic leadership, and political participation. Many of the most challenging environmental, health, and infrastructure issues facing the nation must be addressed through debates involving diverse voices and views expressed by a scientifically literate citizenry. Scientific experts and industry representatives play a significant role in shaping those debates. For these reasons, it is highly problematic when those same racial-ethnic groups who are largely missing from STEM classrooms and the STEM workforce constitute nearly a third of the national population. In 2006, underrepresented racial-ethnic minority groups were only 9.1% of college-educated Americans in the S&E workforce, despite making up 28.5% of the population at that time (NAS, 2011).

To address the underrepresentation of Latinas and Latinos in STEM, Congress recently authorized a billion-dollar investment in STEM education at Hispanic-Serving Institutions (HSIs)³, which will be administered through Title V programs over the present decade (Malcom, Dowd, & Yu, 2010). Recognizing the importance of the public two-year sector as a point of entry into postsecondary education for Latinos, Title V HSI-STEM funding is particularly focused on promoting transfer from community colleges to public four-year universities. These investments are needed because community colleges and HSIs are currently underutilized as a source of STEM degree production in the United States (see Figure 1).

The Center for Urban Education (CUE) has been documenting the educational pathways Latinas and Latinos take in earning STEM degrees, with a focus on transfer from community colleges to HSIs. The purpose of the study is to identify factors that support and enhance Latino success in science and related fields, including various forms of financial aid and financial support. This report documents the negative impact of undergraduate debt on graduate and professional school enrollment among Latina and Latino STEM bachelor’s degree holders and the importance of transfer from community colleges to HSI universities as a relatively low cost pathway to the baccalaureate. The majority of Latino STEM baccalaureates in our study borrowed either from the government or private lenders to earn their bachelor’s degrees (Malcom, Dowd & Yu, 2010). Further, Latinos borrowed at a greater rate —72% —than White and Asian students, among whom borrowing rates were

The 2011 Talent at the Crossroads report called for doubling, tripling and even quadrupling the number of underrepresented students earning science, technology, engineering, and mathematics (STEM) degrees.

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1 The National Academies include the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

2 In this report, we use the terms Hispanic, Latina, and Latino to refer to persons who trace their origin to Mexico, Puerto Rico, Cuba, Spanish speaking Central and South American countries, and other Spanish cultures (Fry, 2008). In addition, rather than always subsuming the feminine to the masculine form, at times we use the expression “Latinas and Latinos” to be explicitly inclusive of Latinas and at times, for ease of reference, the expression “Latino” referring to both Latinos and Latinas.

3 Defined by Title V of the Higher Education Act, a Hispanic-Serving Institution (HSI) is a non-profit institution that has at least 25% Hispanic full-time equivalent (FTE) enrollment (20 U.S.C. 1101, as amended).

Key Findings from Prior Reports in this Series

This report is the fourth in a series produced by CUE on the enrollment and college financing patterns of Latina and Latino bachelor's degree holders in STEM. The following key findings of previous reports inform the findings and policy recommendations of this report.

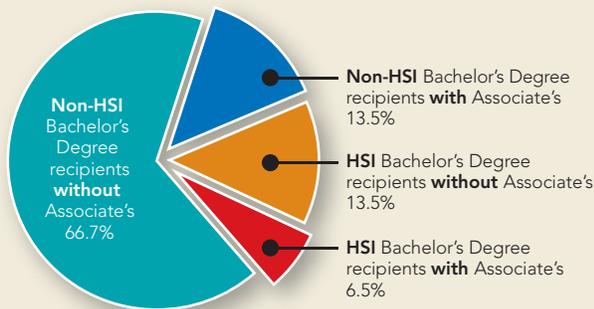
Figure 1. Latino STEM Baccalaureates, by Institutional Pathway

Although the HSI and community college to transfer pathways are very important for Latino students seeking bachelor's degrees, they are underutilized as a source of STEM degree production in the United States.

As shown in Figure 1, the majority of Latino STEM bachelor's degree recipients (66.7%) graduate from four-year institutions that are not designated as Hispanic-Serving Institutions (non-HSIs) without first earning an associate's degree.

Only 6.5% of Latino STEM bachelor's degree holders transferred from a community college with an associate's degree and then earned a STEM bachelor's degree at an HSI.

Figure 1. Latino STEM Baccalaureates, by Institutional Pathway



Source: Analysis of the NSF 2003 National Survey of Recent College Graduates (NSRCG). Weighted N=61,233. May not sum due to rounding.

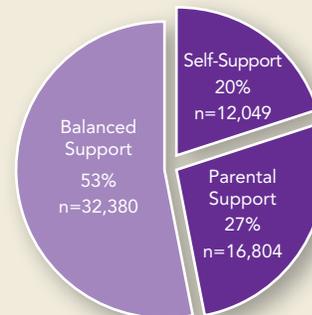
From Dowd, A.C., Malcom, L.E., & Macias, E.E. (2010). Improving transfer access to STEM bachelor's degrees at Hispanic Serving Institutions through the America COMPETES Act. Los Angeles, CA: University of Southern California.

Figure 2. College Financing Strategies of Latino STEM Baccalaureates

Latina and Latino STEM bachelor's degree holders can be characterized as using one of three college financing strategies: balanced support, self-support, and parental support.

Of particular note are the Latino students who earn STEM bachelor's degrees while working and borrowing to pay for college. These "self-supporters" tend to be graduates of HSIs and to earn an associate's degree before going on for the bachelor's. They also tend to be older, working adults from economically modest backgrounds who are the first generation in their family to attend college. Like students in the "balanced support" group, they rely on grants and loans to pay for college; but they are more likely to also use wages from employment to pay their own way.

Figure 2. College Financing Strategies of Latino STEM Baccalaureates



Source: Analyses of the NSF 2003 National Survey of Recent College Graduates (NSRCG) using survey weight (WTSURVY).

From Malcom L.E., Dowd, A.C., & Yu, T. (2010). Tapping HSI-STEM Funds to Improve Latina and Latino Access to the STEM Professions. Los Angeles, CA: University of Southern California.

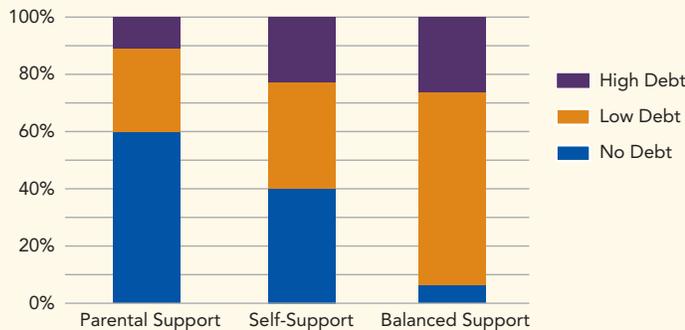
64% and 59% respectively. (African Americans borrowed at an even higher rate than Latinos, at 80%.) This report shows that such high rates of borrowing constrain investments in graduate and professional study by Latinos. Therefore, policies that reduce reliance on undergraduate debt will support the national goal of improving Latina and Latino participation in STEM fields.

Community Colleges and HSIs Provide a Low Debt Pathway to the Baccalaureate

CUE’s study analyzed the National Science Foundation’s 2003 National Survey of Recent College Graduates (NSRCG), which comprises a nationally representative sample of bachelor’s and master’s degree earners in STEM fields⁴. Figure 2 represents analyses reported previously, which show that the majority (53%) of Latino students who earn STEM bachelor’s degrees use a balanced financial aid package of grants, loans, work, and familial support to pay for their undergraduate studies (Malcom, Dowd & Yu, 2010). As shown in Figure 3, students who used the “balanced support” model tended to take on a low amount of debt relative to the mean debt of other students in their graduating class. One-quarter accrued high debt, relative to the mean debt of their peers. (See the Technical Appendix for details on our choice of this measure of relative debt which differs from the absolute magnitude of debt.)

An additional 20% of Latino students earned STEM bachelor’s degrees through a “self-support” strategy that relies primarily on borrowing and/or work off campus (Figure 2). These “self-supporters” tend to be graduates of HSIs and earn an associate’s degree at a community college before going on for the bachelor’s. However, only 6.5% of Latino STEM bachelor’s degree holders transferred from a community college with an associate’s degree and then earned a STEM bachelor’s degree at an HSI (Figure 1), perhaps in part because it is difficult to use the “self-support” strategy and earn a bachelor’s degree in STEM. Typically from economically modest backgrounds, self-supporters were often older than the traditional 18–24 year old college student or among the first generation of their family to attend college. Self-supporters tended to take on a low amount of debt or no debt.

Figure 3. Debt-Level by College Financing Strategy for Latino STEM Baccalaureates



Source: Analyses of NSF 2003 National Survey of Recent College Graduates (NSRCG), using final survey weight (WTSURVY).

⁴ For details about our data sample and analyses see Malcom, L. E. and A. C. Dowd (2012), The impact of undergraduate debt on the graduate school enrollment of STEM baccalaureates, *Review of Higher Education* 35(2): 265-305 and Malcom, L. E. (2008). *Accumulating (dis)Advantage? Institutional and financial aid pathways of Latino STEM baccalaureates*. Unpublished dissertation, University of Southern California, Los Angeles.

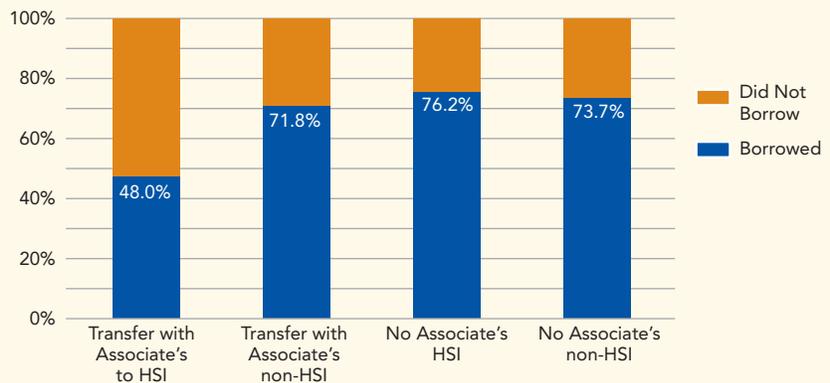
Latino STEM baccalaureates who could count on parental support to fund their undergraduate study were the most likely (60%) to have used a “no debt” strategy to earn their bachelor’s degree.

Latino STEM baccalaureates who could count on familial support to fund their undergraduate study were the most likely (60%) to have used a “no debt” strategy to earn their bachelor’s degree (Figure 3). However, only a small proportion of Latinos (27%) used the “parental support” model (Figure 2). These students tended to be of traditional college age (18-24 years of age) and to attend a non-HSI research university.

The prevalence of the balanced and self-support financing strategies among Latino STEM baccalaureates reflects the fact that Latino students, on average, have more financial need than other students. This is reflected in national statistics showing that nearly 50% of Latino STEM bachelor’s degree holders received a Pell grant during their undergraduate study⁵. Latinos are less likely to enjoy the substantial familial financial support more often afforded White and Asian students that offsets the need to borrow or work. Latinos enrolling in community colleges and public-sector Hispanic-Serving Institutions take advantage of relatively low cost pathways to STEM degrees (NAS, 2011; Malcom, 2010). These lower costs enabled 50% of Latino STEM bachelor’s degree holders who earned an associate’s degree and then transferred to a Hispanic-serving four-year college or university to use a “self-support” strategy and 34% to use a “balanced support” strategy. The college financing of many Latino STEM baccalaureates depends on the availability of the lower cost HSIs and community colleges and on need-based grants.

As shown in Figure 4, Latino STEM bachelor’s degree holders who earned associate’s degrees and graduated from HSIs have the lowest prevalence of borrowing, with only 48.0% taking on any debt. In contrast, roughly three-quarters of those Latinos who did not earn an associate’s degree prior to earning a bachelor’s degree borrowed. This is true whether the institution they graduated from was an HSI or a non-HSI (Figure 4). While the HSI distinction did not affect borrowing for students who did not first earn associates degrees, the picture is different for students who first earned associate’s degrees; it is here that the HSI distinction matters. Students who transferred to a non-HSI were nearly as likely to borrow as those who had enrolled directly at the four-year institution; 71.8% took on debt.

Figure 4. Prevalence of Borrowing among Latino STEM Baccalaureates, by Institutional Pathway



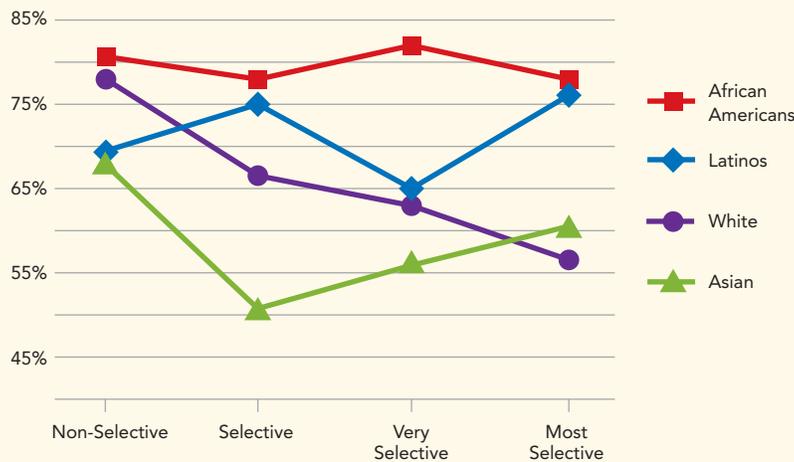
Source: Analyses of NSF 2003 National Survey of Recent College Graduates (NSRCG), using final survey weight (WTSURVY).

⁵ Author’s calculations based on federal data available through the National Center for Education Statistics’ Quick Stats.

Latinos Attending the Most Selective Institutions Borrow at High Rates

Patterns of borrowing among Latina and Latino STEM bachelor's degree holders documented in our study also point to the current importance of loans to ensure access to the most highly competitive and prestigious institutions⁶ for Latino students from families of modest economic means. As shown in Figure 5, Latinos who attend the most selective institutions are borrowing at much higher rates than Asian and White students attending those same institutions (76%, in comparison to 60% and 57%, respectively). The same is true for African Americans, who borrow at the highest rates at all levels of institutional selectivity. In contrast, among White students, rates of borrowing fall steadily from nearly 80% at non-selective institutions to 57% at the most selective institutions.

Figure 5. Percent of STEM Baccalaureates Who Borrowed, by Race/Hispanic Ethnicity and Baccalaureate-Granting Institutional Selectivity



Source: Analyses of NSF 2003 *National Survey of Recent College Graduates* (NSRCG), using final survey weight (WTSURVY).

The pattern of borrowing across selectivity levels is more jagged for Asian students. Additional analyses conducted for this study of NSRCG data indicate that Asian STEM bachelor's degree holders were more likely to borrow from their families than their White, African American and Latino counterparts. Twelve percent of Asians borrowed money from their parents or other family members to pay for college, compared to 9% of Whites, 6% of African Americans and 8% of Latinos. This indicates that Asian students can more readily tap into family resources to fund undergraduate study in STEM and that this offsets the need for borrowing, particularly for students attending institutions ranked as selective and very selective, as shown in Figure 5. These patterns of financing reflect the racial/ethnic differences in wealth in the United States (Elliott & Nam, 2012; Malcom & Ryan, 2011).

⁶ Those who graduated from institutions categorized as "highly competitive," "highly competitive plus," and "most competitive" in the 2004 edition of *Barron's Profiles of American Colleges and Universities*.



Even Low Debt Has a Negative Impact on Professional Preparation

Statistical analyses conducted for our study reveal that Latino students who borrow and take on debt as undergraduates are less likely to enroll in graduate or professional school. (See the Technical Appendix for details of the statistical analyses.) In fact, undergraduate debt, whether in high or low amounts relative to the mean debt in a student’s baccalaureate graduating class, has a negative impact on students of all racial-ethnic groups when compared to the graduate school enrollment of STEM bachelor’s degree holders with no debt.

Latinos with both high and low cumulative undergraduate debt were less likely than those with no debt to enroll in graduate or professional school.

As shown in Table 1, Latinos with high cumulative undergraduate debt relative to others in their graduating class were 17.1% less likely than those with no debt to enroll in graduate or professional school two years after earning their bachelor’s degree. Latinos with low cumulative undergraduate debt relative to others in their graduating class were 13.8% less likely than those with no debt to pursue graduate or professional study. The negative relationship between undergraduate debt and investments in graduate and professional study appears to be greater for Latinas and Latinos than for African Americans, Asians, and Whites, particularly among students taking on high debt. The 17.1% decrease in the likelihood of graduate enrollment among Latinos with high debt is roughly three times higher than the 5% to 6% decrease observed for other racial/ethnic groups. The 13.8% decrease in the likelihood of graduate enrollment among Latinos with low debt is over twice as large as the estimate of a 5.5% decrease observed for White students. In our study, these differences in magnitude are not significant by rigorous statistical standards⁷ (Malcom & Dowd, 2012), but they deserve further investigation in data with larger numbers of Latinos and consideration by policy makers who aim to increase Latino participation and degree completion in STEM. These results illustrate the importance of reducing undergraduate debt to increase the numbers of Latinas and Latinos who earn graduate and professional degrees and enter the STEM professoriate and professional workforce.

Table 1. The Effects of Debt on the Likelihood of Graduate or Professional School Enrollment, by Race and Hispanic Ethnicity

Students with High Debt Compared to Students with No Debt			
African American	Asian	Latino	White
-5.7%	-5.6%	-17.1%	-6%
Students with Low Debt Compared to Students with No Debt			
African American	Asian	Latino	White
-10%	-10.2%	-13.8%	-5.5%

Source: Analyses of NSF 2003 National Survey of Recent College Graduates (NSRCG), using final survey weight (WTSURVY).
Note: Students with high debt and low debt are compared to their same racial-ethnic group undergraduate peers.

⁷ Standard errors were adjusted for the clustering of complex survey data and for multiple comparisons.

At the graduate level, underrepresented minorities are less likely to be supported by research assistantships and teaching assistantships (NAS, 2011). Policies intended to increase Latino participation in STEM must strive for parity in the distribution of research and teaching assistantships, because these also provide entrée to opportunities for advanced scientific skill development and professional networks. However, this access really begins at the undergraduate level. Bachelor's degree graduates from selective research universities are the most likely to be able to tap into these valuable research and teaching assistantships that not only reduce the need for self-supporting financial strategies but also increase the likelihood of access to professional and graduate schools and careers (NAS, 2011; Hurtado, Cabrera & Lin, Arellano & Espinosa, 2009; Malcom, 2010).

Policy Implications

Concerns about undergraduate debt are growing. The recent cover feature story of the American Association of University Professors' *Academe* magazine (Williams, 2012), and numerous articles in national media outlets like *Forbes Magazine* and *US News and World Report*, denote the considerable attention being paid to this topic—and with good reason. Since 2000, more than half of all bachelor's degree recipients graduated with student loan debt. In 2009–10, borrowers who completed their degree at public institutions did so with an average of \$22,000 in student loan debt; borrowers from private institutions averaged \$28,100 of student loan debt (Baum & Payea, 2011). These amounts represent an increase of about \$2,000 in both the public and private sectors from the previous year (Baum & Payea, 2010), which indicates that loan burdens have been increasing. Such high levels of debt have led to concerns that young adults will not be able to repay their loans or make other types of investments, such as in real estate or in raising children.

For most borrowers, taking out loans to pay for college is a necessary and beneficial investment. However, for a smaller but substantial number, educational borrowing for undergraduate studies results in a “lifetime of debt” (Wilson, 2009) or, putting it more dramatically, “indentured servitude” (Williams, 2012). A recent report from the College Board reported that about 17% of all 2007-08 four-year college graduates completed their degrees with “high-debt” (i.e., \$30,500 or more) (Baum & Steele, 2010). Policymakers have begun to recognize the importance of ensuring manageable debt burdens, as evidenced by recent changes to the Income-Based Repayment program and sustained investments in the means-tested Pell grant, which provides \$5,550 annually to low-income students at the maximum award level.

While the unmanageable debt burdens of students with high debt is certainly of concern, the findings of this report point to another problem. Undergraduate debt—even modest amounts—lowers STEM bachelor's degree holders' likelihood of enrolling in graduate school. Debt stifles investments in professional preparation among Latinas and Latinos. Therefore policies that require students to rely on loans to finance higher education are counterproductive to the stated goal of the federal *Crossroads* (NAS, 2011) report of increasing the number of underrepresented minority students in STEM professions.

For Latino students, who average higher levels of financial need than any other racial-ethnic group, a recurring concern has been that debt aversion, or a reluctance to borrow, constrains college choice and limits access to institutions with higher sticker prices, like privates and highly selective colleges and universities. This is a particular concern because

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If Latino students alter their college choices based on concerns about costs and borrowing, the ongoing efforts to broaden participation in STEM fields may be seriously undermined.

these same highly selective institutions often have more extensive and wide-ranging academic programs in STEM fields. They also provide the best jumping off point for entry into graduate and professional school. If Latino students alter their college choices based on concerns about costs and borrowing, the ongoing efforts to broaden participation in STEM fields may be seriously undermined. Therefore, one imperative for policy makers is to ensure access to selective research universities for Latinas and Latinos, through policies that provide need-based aid for undergraduate and graduate study.

It is also clear from our study that those Latinos who earn STEM bachelor's degrees do take on debt; and that debt decreases the likelihood of enrollment in graduate or professional school. Therefore, it is critical to reduce the risks of borrowing and to enable Latino students to see clear pathways to a sound return on their investments in STEM fields of study at the undergraduate and graduate level. To some extent that entails ensuring their readiness for and access to appropriate employment. Those graduates who find jobs in STEM are likely to realize an economic return in the form of higher pay (Melguizo & Wolniak, 2011).

It is also important to support and strengthen the role of community colleges and HSIs in providing preparation for graduate and professional study, because these institutions offer relatively low cost alternatives for the many Latino students who are utilizing the "self-support" and "balanced support" financing strategies, relying on loans, scholarships, grants, and wages earned from work off campus to pay their way through college.

Latinos (as well as African Americans) are also more likely than Asian and White students to use self-support financing strategies, such as personal resources, outside work, and debt, at the doctoral level. Analyses of the National Science Foundation's 2007-2008 Survey of Earned Doctorates shows that racial-ethnic groups underrepresented in STEM are "twice as likely (20.5%) as the average science and engineering doctorate (10.4%) to report self-support as their primary mechanism of support" (NAS, 2011, p. 98). Asian students were the least likely to use their own resources. These differences in access to graduate research fellowships and teaching assistantships indicate that Latinas and Latinos face a different funding environment than their White and Asian peers. This suggests that their avoidance of debt at the undergraduate level may be strategic, because they expect they will face higher costs if they do pursue post-baccalaureate study.

Policy Recommendations

Latina and Latino STEM bachelor's degree holders who borrow are less likely to attend graduate school within two years of earning the bachelor's degree than peers from the same undergraduate institution who graduated with no debt.

Those students who do not accumulate debt are more likely to attend graduate school within this timeframe. Policies that reduce the need to borrow will therefore increase the number of Latinas and Latinos who pursue graduate and professional studies and enter the STEM workforce as doctors, professors, research scientists, computer scientists, engineers, and information technologists.

The following policy recommendations support the national goals stated in the *Talent at the Crossroads* report (NAS, 2011), which calls for an urgent, sustained, and collaborative effort to increase diversity in STEM.

- **Continue and enlarge investments in the federal means-tested Pell grant program.**

Pell grants offset the need for low-income students to borrow and to work long hours off campus. They are an important part of the self- and balanced support college financing strategy favored by three-quarters of Latina and Latino students in our study. Latinos rely on community college and Hispanic-Serving Institutions to maintain a no- to low-debt approach to college financing. For these students, Pell grants are essential to working and paying one's way through college.

To encourage STEM degree completion and use of the more economical community college transfer pathway, the use of Pell grants to fund summer terms should be allowed. Summer terms enable continuous enrollment, which is associated with timely degree completion. STEM students, in particular, have heavy course loads and will benefit from the ability to spread their courses over the full calendar year. Transfer students also have a special need for summer funding, because they may need to complete prerequisites for their major that were not available to them at the community college they attended prior to transfer.

- **Reduce the risks of unmanageable debt burden.**

Congress should keep interest rates on subsidized student loans at their current levels. It is also important to avoid volatile changes in interest rates. Students who are balancing their use of loans, wages, and grants need to be able to manage their finances to take on a level of risk and debt burden that is comfortable for them and well matched with their future employment prospects. To address the burgeoning problem of high debt burdens, the eligibility requirements for the Income-Based Repayment program should also be revisited.



- **Expand access to research assistantships, particularly at community colleges and HSIs.**

National science and health foundations, such as the National Science Foundation and the National Institutes of Health, provide targeted funds for underrepresented minority students for fellowships and scholarships at the undergraduate and graduate level. These often come along with academic supports and access to professional networks and mentoring, such as that provided by the LSAMP and MARC U STAR⁸ programs. These approaches deserve support and extension at community colleges and HSIs, which have typically received a smaller share of such resources (Baez, Gasman, & Sotello Viernes Turner, 2008; Hubbard & Stage, 2009; Laden, 2001). The Title V HSI-STEM funds may be utilized to create such opportunities for undergraduates at two-year and four-year HSIs. This is valuable because such targeted funds reduce the need to borrow and may increase a student's chances of finding work in STEM fields during and improving their preparedness for entry to graduate and professional study.

- **Provide Work-Study aid at HSIs for students to conduct STEM-related research.**

About a quarter of Latina and Latino STEM bachelor's degree holders in our study received work-study aid (Malcom, Dowd & Yu, 2010). Evidence is inconclusive regarding the effectiveness of federal work-study aid on college student persistence and degree completion (Scott-Clayton, 2011). Congress should authorize a more targeted use of work-study funds through a STEM work-study program that will align with and support the current investments in STEM at HSIs (Malcom & Dowd, 2012). Such a program should enable the students who are working their way through college at two-year and four-year HSIs to earn decent wages and gain valuable experience conducting research that will help position them for graduate and professional school enrollment and success in STEM professions. Substantial investments in a STEM work-study research program would reduce debt and shift working hours from off-campus jobs to valuable on-campus interactions with STEM faculty and peers. With about one-quarter of Latino STEM bachelor's degree holders utilizing federal work-study aid, there is room for broader participation—so long as time spent in work study jobs adds value to undergraduate, and future graduate, studies by providing experiences in laboratories, scientific exploration, and technical design work. Investments in a STEM work-study research program are warranted by research showing that low-income students often work too many hours off-campus. On the other hand, working during college in a job that relates to one's major or career goals can have a positive impact on career choice, attainment, and the level of professional responsibility attained early in one's career (NAS, 2011).

⁸ LSAMP is the Louis Stokes Alliance for Minority Participation Program, funded by the National Science Foundation. MARC U STAR is a program of the National Institutes of Health, National Institute of General Medical Sciences. MARC U STAR is one of the two Minority Access to Research Careers (MARC) programs. It stands for MARC Undergraduate Student Training in Academic Research (U-STAR).



- **Explore the potential of Individual Development Accounts (IDAs).**

Congress should authorize federal matching funds for demonstration programs to test and develop the use of Individual Development Accounts (IDAs), which provide incentives for college savings. A fully operational IDA savings program should aim to eliminate the need to take loans, particularly among students at community colleges and HSIs who are facing tuition costs that are more modest than those faced by students at private research universities. As shown by our study, even relatively small amounts of debt may reduce investments in graduate and professional school by Latino STEM bachelor's degree holders. Therefore a no-loan funding option would be of great value to students who would, instead, be provided with opportunities to fund college through savings in IDAs. Recent research illustrates the need for a rethinking of the typical IDA program design for funding postsecondary education (Bryce-Laporte, Yang, & Kezar, 2009; Pathways to College Network, n.d.). For example, under the current IDA structure, there is a possibility that students with IDAs receive less financial aid, because their aid packages are reduced in light of their savings. Such reductions in the overall aid package are counterproductive to the purpose of IDAs proposed here. The policies and design of college financing IDAs should be examined to ensure they assist students who have few resources to pay for college.

IDAs could be a useful vehicle to stimulate private- and public-sector investments in STEM and offset a students' need to borrow. IDA program designs that rely on "place-based" investments by collaborating partners will align with the place-based design of the Title V HSI-STEM program, which is stimulating collaboration among two- and four-year HSIs that serve the same regions or communities. To the greatest extent possible, the STEM-IDA demonstration project should involve community college and university faculty members in collaboration with private-sector investors in the IDA. This will enhance faculty networks with the private sector and the ability of faculty to connect students with employers.

- **Monitor the use of the Title V HSI-STEM grant funds to ensure they promote Latino student preparation for STEM professions.**

Evaluation of the use and impact of the Title V HSI-STEM funds should examine data disaggregated by race and Hispanic ethnicity to ensure that these funds are enabling more Latinas and Latinos to enter, succeed in, and graduate from STEM fields with sufficient preparation for graduate and professional study.

IDA program designs that rely on "place-based" investments by collaborating partners will align with the place-based design of the Title V HSI-STEM program, which is stimulating collaboration among two- and four-year HSIs.



Congress and the Congressional Diversity and Innovation Caucus, should charge the Advisory Council on Student Financial Aid (ACSFA) to provide it with disaggregate analyses of student loan debt by race and ethnicity, family income status, and age in order to obtain a full portrait of students' college financing strategies.

- **Monitor borrowing under federal subsidized loan programs by Hispanic ethnicity and HSI institutional type.**

Our study demonstrates that it is necessary to disaggregate analyses of student loan debt by race and ethnicity, family income status, and age in order to obtain a full portrait of students' college financing strategies. Intergenerational wealth appears to be a significant contributor to the borrowing patterns of Latinos and African Americans in comparison to their White and Asian peers. These patterns will be more visible if federal reports concerning the distribution of financial aid routinely reported data disaggregated by race/ethnicity, age, generational status, institutional type, and geographic region. The Congressional committees responsible for education policy, in coordination with the Congressional Diversity and Innovation Caucus, should charge the Advisory Council on Student Financial Aid (ACSFA) to provide it with reports disaggregated in this manner. Currently the ACSFA is charged with and primarily reports on patterns of financial aid use by income status.

The National Science Foundation contributed to the funding of the Educational Longitudinal Study (ELS) in order to ensure that the sample size was sufficient to provide state-representative results for California, Florida, New York, and Texas. These are states with large Hispanic populations. The data from ELS should be analyzed by ACSFA disaggregated by race and ethnicity in order to inform the development of nuanced federal financial aid policies to expand diversity in STEM fields and, specifically, to ensure Latino student participation.

With over a billion dollars being directed to HSIs over the next decade through the Title V HSI-STEM funds, it also makes sense to routinely identify HSIs in federal data. Although an institution's HSI status is sensitive to changes in enrollment, its status in a prior year or over several years running could serve to indicate HSI status.

Technical Appendix

The estimated effects of undergraduate loan debt on the graduate and professional school enrollment presented in this brief are based on a propensity score matching (PSM) analysis of the National Science Foundation's 2003 National Survey of Recent College Graduates (NSRCG). The NSRCG includes demographic, financial aid, and educational outcome data of individuals who earned bachelor's degrees in STEM fields from U.S. postsecondary institutions. In addition to the NSRCG, data from The Institute for College Access and Success (TICAS) were used to obtain the mean cumulative undergraduate debt level at each NSRCG respondent's baccalaureate-granting institution.

Modeling debt as a treatment.

Our strategy for modeling the impact of debt on graduate and professional school enrollment involved conceptualizing borrowing as a "treatment" and developing three treatment categories for debt: high debt, low debt, and no debt. Prior studies on the relationship between undergraduate borrowing and graduate school enrollment have used absolute debt measured in dollars (e.g., Millett, 2003); however, we defined the level of borrowing relative to a respondent's peers at the baccalaureate-granting institution. The magnitude of debt is operationalized in institutionally based relative terms, rather than in absolute dollars. We take this approach due to previous research that suggests debt is a socially constructed concept and perceptions of indebtedness are influenced by social location and context (Archer & Hutchings, 2000; McDonough & Calderone, 2006). In other words, the debt, or treatment, level (i.e., borrowing) is defined in terms of how it compares to the average cumulative undergraduate debt of the graduating class in the year of interest. Thus, each respondent in our sample was assigned a relative debt level based on the ratio of his or her cumulative undergraduate student loan debt and the average cumulative loan debt of the graduating class at his or her baccalaureate-granting institution (see Malcom & Dowd, 2012 for additional details).

Analytical strategy.

Propensity score matching (PSM) was used to estimate the effect of indebtedness on graduate school enrollment among STEM bachelor's degree holders. Our application of propensity score matching involves three distinct steps: (1) the calculation of propensity scores, that is, the predicted probability of having high and low relative debt as defined above; (2) the creation of a counterfactual framework by matching non-borrower and borrower cases with the same, or similar propensity scores; and (3) the calculation of treatment effects, i.e., the average treatment effect (ATE), the average treatment effect on the treated (ATT), and the average treatment effect on the untreated (ATU).

A constrained multinomial probit regression model was used to generate the predicted probabilities of borrowing at the low debt level and the high debt level based on demographic, institutional, and educational characteristics. The NSRCG survey weight, WTSURVY, was applied to the constrained multinomial probit regression model. These predicted probabilities were then used as propensity scores. For each respondent in the sample, the probabilities of participating in a loan program at a high and low level were used to create a counterfactual framework, i.e., a "treatment" group and a "control" group, through which causality can be inferred. Members of the treatment group borrowed at either the high or low level, and members of the control group did not borrow at all.

We used specialized PSM software (the PSMATCH2 module in Stata) (Leuven & Sianesi, 2003; Sianesi, 2001) to create the "treatment" and "control" groups, check for balance in these two groups, match cases with similar propensities to borrow, and compare the outcome of interest, i.e., graduate and professional school attendance, to estimate the effects of the treatment on graduate and professional school attendance within two years of earning a bachelor's degree in STEM. Using PSMATCH2, we calculated the ATE, ATT, and ATU for each racial/ethnic group separately. We then conducted tests of significance using robust standard errors (which adjusts for the clustering of cases within institutions) to estimate the magnitude of effect of debt on post-baccalaureate enrollment and to determine whether the effects of debt on graduate and professional school enrollment among STEM bachelor's degree holders varies by race/ethnicity.

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For Further Reading

Selected Articles and Book Chapters by CUE Researchers on STEM, Hispanic Serving Institutions, and Transfer

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