



# **MAKING THE GRADE:**

The Economic Impact of Attracting and Retaining International Students in Ohio

Produced by the Partnership for a New American Economy  
for The Ohio Board of Regents

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# Executive Summary

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The American university system has long been a powerful draw for talented international students. Our top schools have some of the largest endowments and research and development budgets in the world, allowing them to carry out important and cutting-edge research in everything from semiconductors to cancer care.<sup>1</sup> All-star faculty members populate the hallways and classrooms of many top U.S. schools. In 2014, for instance, Stanford University was home to 21 living winners of the Nobel Prize,<sup>2</sup> while the University of Chicago was home to eight,<sup>3</sup> giving students from around the globe the opportunity to interact with some of the preeminent researchers in their fields.

But the international students who choose to study at American institutions don't just benefit from what U.S. universities can offer—they make their own important contributions to the schools and communities where they study as well. The World Bank has found that increasing the number of international graduate students studying at American schools substantially boosts the number of patents awarded to those research institutions in the years that follow.<sup>4</sup> International students also contribute heavily to the U.S. economy by spending money on items like tuition, housing, school supplies, and food. A recent report by NAFSA, an American association of international educators, estimated during the 2013-2014 school year, international students contributed \$26.8 billion to the U.S. economy—a contribution that supported 340,000 U.S. jobs.<sup>5</sup>

There is also increasing evidence that international students are able to make these contributions to the American economy without depriving U.S.-born students of educational opportunities. A recent study by an economist at the University of California, Davis examining data on graduate student enrollment from 1995 to 2005 found that bringing in more international students allowed universities to expand and offer more slots to U.S.-born students as well. Specifically, the addition of one foreign-born graduate student during that period led one additional native-born graduate student to also enroll.<sup>6</sup>

Such benefits have led many state and local legislators to focus on attracting international students to their state. These leaders have also argued that rather than sending such students home—or to other job markets—after graduation, international students trained in the state should also be encouraged to remain in-state after completing their degrees, where they could contribute to the region's economy still further.<sup>7</sup> Such contributions are possible because foreign graduates often bring new skills, global networks, or specialized training to a given state's overall workforce, allowing a more diverse group of companies to base or expand

1 Caroline Howard, Forbes, "U.S. Dominates the World's Top Colleges—For Now." (Sept. 10, 2013). Accessed Feb. 10, 2015, available here: <http://www.forbes.com/sites/carolinehoward/2013/09/10/the-worlds-top-colleges-2013/>.

2 "Stanford: Nobel Laureates" [Stanford University Website], Accessed Feb. 10, 2015, available here: <http://news.stanford.edu/nobel/>.

3 "Nobel Laureates"[The University of Chicago Website], Accessed Feb. 10, 2015, Available here: <http://www.uchicago.edu/about/accolades/22/>.

4 Chellaraj, Gnanaraj, Keith E. Maskus, and Aaditya Mattoo. 2005. "The Contribution of Skilled Immigration and International Graduate Students to US Innovation." World Bank Policy Research Working Paper (3588). Retrieved November 10, 2014 ([http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=744625](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=744625)).

5 NAFSA "International Student Economic Value Tool," Accessed Feb. 10, 2015, available here: [http://www.nafsa.org/Explore\\_International\\_Education/Impact/Data\\_And\\_Statistics/The\\_International\\_Student\\_Economic\\_Value\\_Tool/](http://www.nafsa.org/Explore_International_Education/Impact/Data_And_Statistics/The_International_Student_Economic_Value_Tool/).

6 Kevin Y. Shih, "The Impact of International Students on U.S. Graduate Education" (Jan. 15, 2015). Working paper. Accessed Feb. 10, 2015, available here: [http://kevinshih.weebly.com/uploads/5/5/8/7/5587146/shih\\_jmp\\_1\\_7\\_2015.pdf](http://kevinshih.weebly.com/uploads/5/5/8/7/5587146/shih_jmp_1_7_2015.pdf).

7 Daniel J. McGraw, Politico, "The Real GOP Split on Immigration" (Jan. 14, 2015). Accessed Feb. 10, 2015, available here: <http://www.politico.com/magazine/story/2015/01/gop-immigration-split-113396.html#.VNpjhEvTWMM>.

their operations in the area. This, in turn, creates more job opportunities for local workers. This phenomenon holds especially true for graduates with degrees in the Science, Technology, Engineering, and Math (or STEM) fields. A 2011 report released by the Partnership for a New American Economy and the American Enterprise Institute found that the addition of 100 immigrants with advanced degrees in STEM from U.S. universities to a state's population was associated with the creation of 261 jobs for U.S.-born workers in the seven years that followed.<sup>8</sup>

In this report, we use data from the U.S. Department of Education, the Bureau of Economic Analysis, and the Bureau of Labor Statistics, among other sources, to estimate how policies aimed at attracting and retaining more international students, which are currently being considered by the state of Ohio, may impact that state's economy in the long term. Ohio already is home to many international students. In the fall of 2013, almost 30,000 international students were studying in Ohio, a group that made up 4.1 percent of college and university students in the state.<sup>9</sup> Those students alone contributed more than \$872 million to the state's economy that year and supported more than 11,000 jobs.<sup>10</sup> In part because of the large economic benefit of these international students, The Ohio Board of Regents recommended earlier this year that the state adopt policies that would increase the number of international students studying in Ohio, as well as the number who stay in the state after graduation.<sup>11</sup> Currently, Ohio retains only an estimated 31.4 percent of the international students who study in its largest student centers in the years immediately after they complete their degrees—a figure far below the national average of 45 percent.<sup>12</sup>

As this study shows, policies aimed at increasing Ohio's population of international students—and keeping more of them in the state after graduation—could provide a valuable stimulus to the Ohio economy. Growing the number of international students in Ohio so that they make up 8 percent of all postsecondary students in the state overall (instead of the 4 percent they make up today) would create almost 11,500 new jobs for Ohio workers and potentially boost the revenues the state's universities earn from innovations and patent licensing. Retaining just half of those new international students in the state after graduation—a figure more in line with national averages—could also transform the face of Ohio, attracting as many as 84,000 additional workers and taxpayers to the state in the coming decades.

8 Madeline Zavodny, American Enterprise Institute and the Partnership for a New American Economy, "Immigration and American Jobs" (Dec. 15, 2011). Accessed Feb. 10, 2015, available here: <http://www.renewoureconomy.org/research/>.

9 Data on international enrollment is derived from The Integrated Postsecondary Education Data System maintained by the National Center for Education Statistics. Available here: <http://nces.ed.gov/ipeds/datacenter/>.

10 Economic data is derived from The International Student Economic Value Tool maintained by NAFSA, the association of international educators. Available here: [http://www.nafsa.org/Explore\\_International\\_Education/Impact/Data\\_And\\_Statistics/The\\_International\\_Student\\_Economic\\_Value\\_Tool/](http://www.nafsa.org/Explore_International_Education/Impact/Data_And_Statistics/The_International_Student_Economic_Value_Tool/). Our figures differ slightly as they focus solely on students on temporary visas.

11 Ohio Board of Regents, "Chancellor John Carey's Recommendations for Ohio's Postsecondary Globalization Initiative," (Jan. 2015), available here: <https://www.ohiohighered.org/sites/ohiohighered.org/files/uploads/global/GREATreport.pdf>.

12 A 2014 study by Brookings found that nationally 45 percent of students on an F-1 visa in the 118 largest metropolitan areas in the country remain in the city where they studied after graduation. The rate for the six Ohio metropolitan areas included in the study was just 31.4 percent, the figure we use as a rough estimate here. See: Neil G. Ruiz, Brookings, "The Geography of Foreign Students in U.S. Higher Education: Origins and Destinations" (Aug. 14, 2014), available here: <http://www.brookings.edu/research/interactives/2014/geography-of-foreign-students#/M10420>.

# Key Findings

1

**Increasing the share of international students at universities in Ohio would generate hundreds of millions of dollars in economic impact and support thousands of new jobs.**

Increasing the share of international students just two percentage points, from 4.1 percent to 6 percent of all postsecondary students in the state overall, would increase the total economic contributions of international students by \$420 million to more than \$1.2 billion in total, and support an additional 5,751 jobs over what international students support today. If the international student population were to grow another two percentage points, so that such students made up 8 percent of all postsecondary students in the state, the amount contributed to the state's economy each year such students would grow by \$835 million and 11,500 new jobs would be created for Ohio workers.

2

**An increase in the number of international students trained in the state's schools who remain in the state after graduation would create thousands of additional jobs, boost state GDP, and increase population growth.**

If for four years, the state succeeded in retaining 50 percent of its international student population, instead of the roughly 30 percent it retains now, those students would have a powerful impact on the state's economy in the long term. Those additional students would create as many as 8,864 new jobs within six years, increase GDP by as much as \$1.4 billion over the next 30 years, and grow the state's overall population by approximately 84,000 over the next 50 years over projected patterns otherwise.

3

**Increasing the number of international students studying at Ohio universities is expected to benefit the overall academic environment by increasing the number of patents awarded at these universities, boosting their global competitiveness.**

Increasing the number of international students in the state by roughly 15,000 people (the 6 percent scenario) or 30,000 people (the 8 percent scenario) would result in a 28.3 to 56.9 percent increase in the number of patents awarded at universities statewide.

The results presented in this study offer a powerful argument for policies that promote the attraction and retention of international students. Currently, other states are actively doing such work, most notably the state of Michigan, which has a Global Talent Retention Initiative that brings together universities, employers, and other key stakeholders to help international students remain in the state after graduation.<sup>13</sup> However, while states and city offices are often able to play a role giving guidance for visa applications or helping match foreign students with local jobs, state policymakers are still hampered in their efforts by America's broken immigration system. Currently, large numbers of students are unable to remain in America after graduation for the long term, due to the very limited number of high-skilled H-1B visas our economy makes available each year.<sup>14</sup> Caps on the number of green cards that are awarded to nationals of any one country in a given year have created incredibly long waits for students from China or India looking to make a permanent home in America.<sup>15</sup> If Congress were to fix such issues, states like Ohio would potentially face an easier road implementing policies aimed at attracting and keeping international students and graduates. The resulting economic benefits could also be greater than predicted here.

<sup>13</sup> Global Talent Retention Initiative of Michigan, "About Us" [Webpage]. Accessed Feb. 10, 2015, available here: <http://www.migtri.org>.

<sup>14</sup> Melissa Zhang, The Daily Californian, "Off the Beat: International Students Need Not Apply" (Jan. 26, 2015). Accessed Feb. 10, 2015, available here: <http://www.daily-cal.org/2014/01/26/beat-international-students-need-apply/>.

<sup>15</sup> Stuart Anderson, National Foundation for American Policy- Policy Brief, "Waiting and More Waiting: America's Family and Employment-Based Immigration System," (October 2011). Accessed 1/5/2012. [http://www.nfap.com/pdf/WAITING\\_NFAP\\_Policy\\_Brief\\_October\\_2011.pdf](http://www.nfap.com/pdf/WAITING_NFAP_Policy_Brief_October_2011.pdf).

## PART I:

# The Economic Impact of Attracting More International Students

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In the 2013-2014 school year, more than 866,000 international students were studying at U.S. colleges and universities, a record number.<sup>16</sup> This group, as discussed above, made a large impact on the economies of many U.S. states. In the 2013-2014 school year, international students nationwide spent almost \$19.8 billion on tuition and \$16.3 billion on housing—and just \$9.7 billion of their spending was offset by schools, governments, or other groups in the form of scholarships.<sup>17</sup> In the state of Ohio, such spending resulted in international students contributing more than \$872 million to the state's economy overall that year, a figure that allowed them to support more than 11,000 jobs. Given the spending patterns of students, these added positions were largely in the higher education, accommodation, retail, and dining industries.<sup>18</sup>

In this section, we model what would happen if instead of making up 4.1 percent of the postsecondary student population in the state of Ohio, international students instead made up 6 percent—or even 8 percent—of the total number of students enrolled in colleges and universities in the state. Based on recent trends in Ohio university enrollment, it is not unreasonable to think that a targeted effort aimed at attracting international students could grow the state's population of international students to this level. Between 2008 and 2013, the number of international students choosing to study in Ohio grew by approximately 1.3 percent, absent any organized effort by the state to recruit them.<sup>19</sup> In this brief, we assume the state is able to meet the 6 and 8 percent targets within two years.

<sup>16</sup> Institute of International Education, "Open Doors 2014: International Students in the United States and Study Abroad by American Students are at an All-Time High" [Press release], Nov. 17, 2014. Accessed Feb. 10, 2015, available here: <http://www.iie.org/Who-We-Are/News-and-Events/Press-Center/Press-Releases/2014/2014-11-17-Open-Doors-Data>.

<sup>17</sup> NAFSA, 2013-2014, International Student Contribution Fact Sheet, United States edition. Accessed Feb. 10, 2015, available here: [http://www.nafsa.org/\\_/File/\\_/eis2014/USA.pdf](http://www.nafsa.org/_/File/_/eis2014/USA.pdf).

<sup>18</sup> For a breakdown of the largest industries the benefitted from the international students in Ohio in 2013-2014, see NAFSA's International Student Economic Value Tool, Ohio edition. Available here: [http://www.nafsa.org/Explore\\_International\\_Education/Impact/Data\\_And\\_Statistics/The\\_International\\_Student\\_Economic\\_Value\\_Tool/](http://www.nafsa.org/Explore_International_Education/Impact/Data_And_Statistics/The_International_Student_Economic_Value_Tool/).

<sup>19</sup> Data on total student enrollment in the state is derived from The Integrated Postsecondary Education Data System maintained by the National Center for Education Statistics. See footnote 7.

We also assume the total number of university seats in the state continues to grow during this period. From 2008 to 2013, Ohio postsecondary schools grew the total number of slots in their universities by roughly 1.5 percent per year.<sup>20</sup> In this study, our model assumes universities continue to grow

at the same rate during the two-year period when the state is ramping up its population of international students. The number of additional students needed to reach the 6 and 8 percent targets can be seen in Table 1 below.

20 Ibid.

**TABLE 1:**  
Projected Number of Additional Students Needed for International Students to Make Up 6 or 8 percent of Total Enrollment in Ohio's Colleges and Universities Within Two Years

	PROJECTED # OF UNIVERSITY SEATS	NUMBER OF INTERNATIONAL STUDENTS AT 6%	ADDITIONAL # OVER FALL 2013 ENROLLMENT NEEDED TO REACH 6%	NUMBER OF INTERNATIONAL STUDENTS AT 8%	ADDITIONAL # OVER FALL 2013 ENROLLMENT NEEDED TO REACH 8%
UNDERGRAD	644,192	24,924	8,388	33,233	16,697
GRADUATE	96,589	19,522	6,570	26,030	13,078
<b>TOTAL</b>	<b>740,781</b>	<b>44,447</b>	<b>14,959</b>	<b>59,262</b>	<b>29,774</b>

## Economic Impact if International Students Reach 6 or 8 Percent of Postsecondary Students in the State Overall

Given the large economic contributions international students are already making to the state of Ohio, we would expect that growing the population of international students by either roughly 15,000 or 30,000 people—as would be needed to meet the two targets described above—would have a substantial economic benefit to the state. This bears out in the figures. For international students to make up 6 percent of total enrollment in the state, Ohio would need to grow the number of foreign students in the U.S. on temporary visas to a total of 44,447 within the next two years. That larger group of international students would contribute an estimated \$1.2 billion annually to Ohio's economy and support 17,088 jobs for Ohio U.S.-born residents. This translates into 5,751 more jobs and almost \$420 million more in economic contributions compared to 2013 levels.

Of course, meeting the 8 percent target would increase the economic contribution of international students in the state still further. If international students on temporary visas were to make up 8 percent of the total student population in the state within the next two years—resulting in a total population of 59,262 international students—they would support an estimated 22,783 Ohio jobs. They would also invest almost \$1.7 billion in the state's economy each year. This represents an increase in 11,447 jobs for the state over 2013 levels, and almost \$840 million more in economic investment. The results of both scenarios are shown in Table 2 below.

TABLE 2:

Estimated Impact on the Economy and Job Creation of Growing the Number of International Students in Ohio so They Make Up 6 or 8 Percent of All Postsecondary Students in the State

	TOTAL ECONOMIC CONTRIBUTION (IN MILLIONS OF \$)	TOTAL NUMBER OF JOBS SUPPORTED	NET NEW JOBS SUPPORTED	ADDITIONAL ECONOMIC CONTRIBUTION (IN MILLIONS OF \$)
2013 (CURRENT)	\$827	11,337	---	---
6 PERCENT	\$1,247	17,088	5,751	\$420
8 PERCENT	\$1,662	22,783	11,447	\$835

## PART II:

# Benefit of Raising the Number of International Students who Remain in Ohio After Graduation

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A 2013 study by the Brookings Institution found that 45 percent of international students in the 120 largest international student centers nationwide remained in the areas where they study after graduation on Optional Practical Training (OPT) visa. The figures for Ohio cities, however, were much lower. For example, Toledo only maintained 22.2 percent of its students. In Akron, just 21.6 percent of international students stayed in the state. The most successful cities in Ohio in this respect, Columbus and Cleveland, retained just 37.7 percent and 39.7 percent of their international student populations, respectively.<sup>21</sup>

Retaining students is important from an economic perspective. In many parts of Ohio, encouraging more foreign-born undergraduates and graduate students to remain in an area as workers and residents would help raise the average level of education of residents overall. A larger supply of more educated workers, in turn, would help companies be able to expand and conduct cutting-edge work within state lines, creating more jobs for workers at all skill levels. Numerous studies have shown that higher levels of educational attainment and denser concentrations of human capital have significant positive economic effects for both cities and regions. These effects range from increases in productivity, job creation, wages, and population growth, as more people move to areas once in decline.

Using a variety of data from the U.S. Census, Bureau of Labor Statistics, and the U.S. Department of Commerce, and economic models developed by economists at Harvard University,<sup>22</sup> Clemson University,<sup>23</sup> and Gustavus Adolphus College,<sup>24</sup> we estimate how retaining 50 percent of international students—a figure more in line with the national rate calculated by Brookings—would impact the state on a variety of economic variables. Our figures in this section assume that Ohio is able to encourage more of the international students already here to remain after graduation, while at the same time attracting more international students to come study in the first place. Specifically, we model how a 50-percent retention rate would

21 Neil G. Ruiz, Brookings, "The Geography of Foreign Students in U.S. Higher Education: Origins and Destinations" (Aug. 29, 2014). Available here: <http://www.brookings.edu/research/interactives/2014/geography-of-foreign-students#/M10420>.

22 Edward L. Glaeser, Giacomo A. M. Ponzetto, and Kristina Tobio, "Cities, Skills and Regional Change," *Regional Studies*, Vol. 48-1, (January, 2014).

23 Curtis Simon, "Human Capital and Metropolitan Employment Growth," *Journal of Urban Economics* 43, (1998).

24 Rita Ray, "Effect of Education on Gross Domestic Product: A Case Study from US 'Mid-West'," *International Review of Business Research Papers*, Vol. 10-1. (March, 2014).

impact the state if 6 or 8 percent of the total postsecondary student population in the state were comprised of foreign-born students on temporary visas.

When assessing how retaining more students might impact factors like the state's Gross Domestic Product or number of jobs, we must calculate our estimates over different time frames. This is because our estimates build off of previous work in this field, and we are reliant on the time periods other researchers used when analyzing such issues. For job growth, for instance, the effects listed are for a six-year period after the target of 6 or 8 percent enrollment target is reached. For effects on GDP, the effect is given at the end of a 30-year period. For income and population growth, the effects are calculated over a 50-year period. Such positive effects should be viewed as increases on top of the natural growth in GDP, job growth, and population that would occur normally due to natural increase, fluctuations in the national economy, and inflation.

It is also worth noting that while the rates of change we describe here may seem small, they gain more heft when

placed in context. As discussed above, within two years, Ohio hopes to raise the number of international students to a total of either 44,476 or 59,262 people—or roughly 6 or 8 percent of all postsecondary students enrolled in the state overall. Instead of being cumulative, our figures examine what would happen if the state were able to convince just 50 percent of those students—or just 22,238 people in the 6-percent scenario—to remain in the state in the years after they graduate. Given that we're looking at a relatively small number of people enrolled in the state's institutions during a short window of time, the impact they have in the years after their studies conclude is actually quite significant. If the state makes the 50 percent retention effort an ongoing policy, the cumulative impact of such policy as its repeated year after year would become far larger than what is documented here.

In chart 3 below, we show the total number of students we assume are retained in the state under both the 6 and 8 percent enrollment models. The impacts we describe in this section are due solely to retaining these individuals in the years after they graduate, not retaining future classes of students going forward.

**TABLE 3:**  
**Number of International Graduates on Temporary Visas Remaining in State after Graduation if Ohio Retains 50 Percent of its International Graduates**

IF INTERNATIONAL STUDENTS MAKE UP...	6 PERCENT OF POSTSECONDARY ENROLLEES IN OHIO OVERALL	8 PERCENT OF POSTSECONDARY ENROLLEES IN OHIO OVERALL
NUMBER OF FOREIGN STUDENTS RETAINED IN STATE	22,238	29,650

## Estimating the Economic Impact of Retaining More Students

To determine the number of jobs we expect to be created if more international students remained in Ohio after graduation, we use a model developed by Curtis Simon, an economics professor at Clemson University. In a paper in the *Journal of Urban Economics*, Simons finds that a 1 percent rise in the share of adults with a higher education (Bachelor's degree or higher) in a county results in a 0.9 percent increase in employment for all residents in the area during the six years

that follow. Statewide, that means that if Ohio raised the number of international students so they made up 6 percent of enrollees in colleges and universities in the state overall, we calculate that retaining half of those students in Ohio would create an additional 4,468 jobs statewide within the next 6 years. For the 8 percent scenario, this number increases to 8,864 additional jobs for Ohio residents.

**TABLE 4:**  
**Number of Jobs Created Within 6 Years if Ohio Retains 50 Percent of its International Graduates**

IF INTERNATIONAL STUDENTS MAKE UP...	6 PERCENT OF POSTSECONDARY ENROLLEES IN OHIO OVERALL	8 PERCENT OF POSTSECONDARY ENROLLEES IN OHIO OVERALL
NUMBER OF ADDITIONAL JOBS CREATED, STATEWIDE	4,468	8,864

(Source: Bureau of Economic Analysis, 2013)

To assess the potential impact of retaining more highly educated international students on Ohio's Gross Domestic Product, we use a model developed in 2014 by Rita Ray, an economics professor at Gustavus Adolphus College. Ray's work finds that each time the number of adults with higher education rises by 1 percent in a given state, the state enjoys a 1.77 percent boost in per capita GDP in the 30 years that follow. Applying her finding to our work, we find that if international students make up 6 percent of the state's postsecondary students population—and 50 percent of those students remain in Ohio after graduation—we would expect the average per capita GDP of individuals in Ohio to go up by \$62 within the next 30 years. If the same retention rate were achieved in our 8 percent scenario, per capita GDP would go up by \$123 over a 30-year period. Taken in the aggregate, this translates into a sizeable impact. Retaining 50 percent of the

students in the 6-percent scenario would raise the state's GDP by \$718.7 million. In the 8 percent scenario, the equivalent figure is \$1.4 billion over a 30-year period.

In counties with higher levels of international students, the effects on per capita GDP documented above would be much higher. For example, in Portage County just outside Akron, which already has a higher than average international student population, per capital GDP would rise by more than \$250 for the lower target scenario, and \$497 for the 8 percent scenario over a 30-year period. Per capita increases in GDP are an especially important measure for economists. They are a sign of an expanding economy, one in which economic growth outpaces population increases, potentially producing higher standards of living for the population overall.

**TABLE 5:**  
**Amount Per Capital GDP Would Grow Over 30 Years if Ohio Retains 50 Percent of its International Graduates**

IF INTERNATIONAL STUDENTS MAKE UP...	4.1 PERCENT OF POSTSECONDARY ENROLLEES IN THE STATE (CURRENT VALUE)	6 PERCENT OF POSTSECONDARY ENROLLEES IN THE STATE	8 PERCENT OF POSTSECONDARY ENROLLEES IN THE STATE
PER CAPITA GDP	\$45,033.65	\$45,090.90	\$45,147.42
TOTAL GDP (IN MILLIONS)	\$565,300	\$566,018	\$566,728
NET CHANGE FROM CURRENT (IN MILLIONS)	---	\$718.7	\$1,428.2

Studies have consistently found that when there is more economic opportunity in a given area—or more immigration—more native-born individuals move there to take advantage of newly created work opportunities. Similar to the effects on GDP, researchers at Harvard University have found that a 1 percent increase in the share of the adult population with a Bachelor’s degree or higher raises the population of a given area by 3.4

percent over a 50-year period.<sup>25</sup> Using that model, we estimate that retaining 50 percent of the foreign students in the 6 and 8 percent scenarios would raise the population of the state by 42,387 and 84,103 people, respectively over a 50-year period.

<sup>25</sup> See footnote 4.

**TABLE 6:**  
**Amount Population Would Grow Statewide in the Next 50 Years as a Result of Ohio Retaining 50 Percent of its International Graduates**

IF INTERNATIONAL STUDENTS MAKE UP...	6 PERCENT OF POSTSECONDARY ENROLLEES IN THE STATE	8 PERCENT OF POSTSECONDARY ENROLLEES IN THE STATE
INCREASE IN POPULATION	42,386	84,103

Beyond the various economic impacts described above, we estimate that the foreign-born graduates Ohio hopes to retain would contribute billions of dollars to the economy over the course of their working lives. Here, using income estimates for college-educated foreign-born workers from the U.S. Census Bureau—and estimating a 40-year prime working life—we estimate that the graduates retained in Ohio under

the 6 percent scenario would earn \$57 billion over the course of their working lives. The almost 30,000 students retained in the 8 percent scenario would earn \$76 billion. Through taxes, a portion of such funds could help support state and local governments. Foreign graduates could also use such funds as consumers at local businesses or to start their own companies, further stimulating the local economy.

**TABLE 7:**  
**Total Projected Lifetime Earnings of International Graduates if Ohio Retains 50 Percent of its International Graduates**

IF INTERNATIONAL STUDENTS MAKE UP...	6 PERCENT OF POSTSECONDARY ENROLLEES IN THE STATE	8 PERCENT OF POSTSECONDARY ENROLLEES IN THE STATE
TOTAL LIFETIME EARNINGS (IN BILLIONS)	\$57.1	\$76.2

## PART III:

# The Benefits of International Exposure for Ohio Students

The figures above demonstrate that keeping more international students in the state could have major benefits for Ohio residents in terms of job creation and GDP growth in the years that follow. In this section, we discuss another way that foreign students in Ohio can benefit residents of the state—by increasing innovation and the amount of global exposure available to students at Ohio’s top research institutions. Past studies have found that when the number of international students studying at a given U.S. university increases, the number of patents awarded to that institution grows as well, a strong indicator of research activity and innovations on campus—particularly in the important STEM fields.<sup>26</sup> In this study, we rely on a finding on this topic produced by researchers at the World Bank. Specifically, they find that every time the number of foreign-born students on a campus increases by 10 percent, the number of patents awarded to the university rises by 6.8 percent in the seven years that follow.<sup>27</sup>

In 2013, Ohio universities received 211 patents in total, according to a PNAE analysis of publicly available patent data.<sup>28</sup> If the number of international students arriving in the state were to grow by roughly 15,000 or 30,000 people, this would result in a meaningful increase in patenting and innovation in the state within the next decade. We estimate that if the number of international students rises by roughly 15,000 people (the 6 percent scenario) in the next two years, Ohio universities will receive 60 additional patents by 2022 as a result. Reaching the 8 percent target for international enrollment would result in 120 additional patents for the state during that period.

<sup>26</sup> See the World Bank study cited in footnote 3. Also: Hunt, Jennifer and Gauthier-Loiselle, Marjolaine. “How Much Does Immigration Boost Innovation?” National Bureau of Economic Research. September 2008. Accessed 12/10/2011. <http://www.nber.org/papers/w14312>.

<sup>27</sup> See footnote 4.

<sup>28</sup> To derive the patent counts, we used the data on patent assignees available from Patent Full-Text and Image Database maintained by the US Patent and Trademark Office (Available at: <http://patft.uspto.gov/netahtml/PTO/search-adv.htm>).

This increase could have an impact on the finances of Ohio's top research institutions. In 2012, Ohio State University, Case Western University, and Ohio University earned \$16.2 million in licensing revenues from university patents. Ohio State, however, lagged far behind its Big 10 peers, generating just \$2.2 million off its patented research, compared to the \$41.1 generation by the University of Wisconsin System.<sup>29</sup> Increasing patenting activity could help Ohio universities meet their goal of continuing to grow licensing revenue. It could also play a valuable role helping the state compete in an increasingly innovation driven economy.

29 Encarnacion Pile, The Columbus Dispatch, "Ohio State's Pricey Research Fails to Generate Much Income" (Dec. 9, 2013). Accessed Dec. 1, 2014, available here: <http://www.dispatch.com/content/stories/local/2013/12/09/research-at-osu-lacking-in-income.html>.

**TABLE 8:**  
**How the Number of Patents Awarded to Ohio Universities would Grow if the State Enrolled more Foreign-Born Students**

	2013	2022, IF INTERNATIONAL STUDENTS MAKE UP 6 PERCENT OF POSTSECONDARY ENROLLMENT	2022, IF INTERNATIONAL STUDENTS MAKE UP 8 PERCENT OF POSTSECONDARY ENROLLMENT
NUMBER OF PATENTS AWARDED TO OHIO SCHOOLS	211	271	331
% INCREASE IN NUMBER OF PATENTS		<b>28.3%</b>	<b>56.9%</b>