

FOREIGN-EDUCATED ENGINEERS: BARRIERS TO EMPLOYMENT AND PROFESSIONAL RELICENSING IN ILLINOIS



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The Migration Policy Institute (2013) and Upwardly Global (2014) have documented the complexity of entering the engineering field, as well as the obstacles to employment and relicensing experienced by foreign-educated engineers who wish to rebuild their career in the United States. Research shows that college-educated immigrants are often unemployed or working in low-skilled occupations, which results in a significant waste of skills, also known as skill underutilization or “brain waste.” We are interested in exploring the extent to which “brain waste” is affecting foreign-educated engineers and the engineering industry in Illinois.

Illinois is in need of engineers--particularly civil engineers--given that its transportation and water infrastructure is severely in need of upgrades and repairs. According to the Chicago Tribune (2013), a report issued by the American Society of Civil Engineers states that:

[A]bout 73 percent of Illinois roads are rated to be in poor or mediocre shape... more than 2,300 of the approximately 26,500 bridges in Illinois are considered structurally deficient... [and] Illinois needs \$17.5 billion in wastewater infrastructure improvements over the next 20 years, and \$15 billion to modernize drinking water infrastructure over the same period.

The demand for engineering services will continue to grow. According to the *State of Illinois Occupational Employment Projections (Long-term), 2010-2020*, it is estimated that by the year 2020 engineering occupations will grow by 8.9 percent and civil engineering will experience the largest change in the field with an increase of 17 percent.

We believe that talented foreign-educated engineers and their skills will be essential over the next few years as demand grows due to an expected major push for rebuilding the infrastructure of Illinois. It is expected that funding for these initiatives will become available, which will also increase the number of projects and jobs in the engineering field. Competition will increase and engineering firms will seek unique talent to show their competitive advantage. Foreign-educated engineers who are authorized to work in the United States could play an important role in implementing these projects.

This report will present an original demographic profile of the foreign-educated engineers in Illinois and a discussion of the barriers to employment and professional licensing that they face in Illinois, supplemented with findings from an online survey conducted by ICIRR and Upwardly Global. We include a list of policy and programmatic recommendations to remove these barriers and promote the integration of foreign-educated engineers into the Illinois workforce.

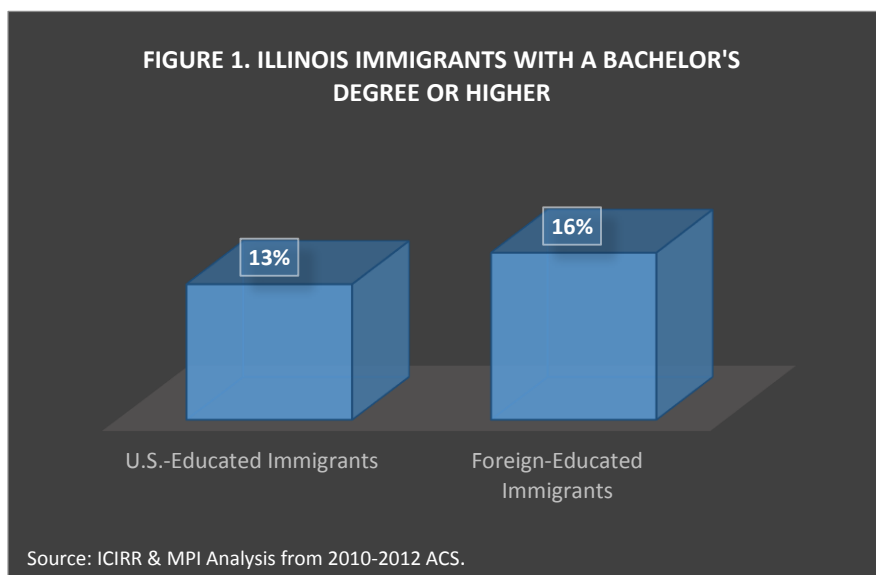
METHODOLOGY

In collaboration with the Migration Policy Institute (MPI), we obtained data from the Integrated Public Use Microdata Series (IPUMS) to produce a previously unavailable demographic profile of foreign-educated engineers in Illinois. To examine their demographic characteristics, we pooled ACS data from 2010, 2011, and 2012. Although we knew that Illinois is home to approximately 1.8 million immigrants, or 14 percent of the state’s population, it was unclear how many of them were engineers and what their characteristics were.

To begin, we examined the number of Illinois immigrants who have at least a bachelor's degree. As Jeanne Batalova, Michael Fix, and Peter A. Creticos (2008) mention in their report *Uneven Progress: The Employment Pathways of Skilled Immigrants in the United States*, "ACS data does not report the country where respondents received their education," which means that we need to use another measurement to determine whether or not immigrants received their degree outside the United States. To obtain those estimates, Batalova and her colleagues defined "foreign-educated" immigrants as people who received at least a bachelor's degree and entered the United States at age 25 or older. Similarly, they defined "US-educated" immigrants as those who have at least a bachelor's degree and entered the United States before age 25. We use the same proxy in this analysis. The ACS does not report degree fields above the bachelor's level, which means that our analysis is limited only to those who received a bachelor's degree in engineering. Although we cannot measure if foreign-educated engineers received a master's or doctoral/professional degree in engineering, we are able to provide an estimate of their education levels.

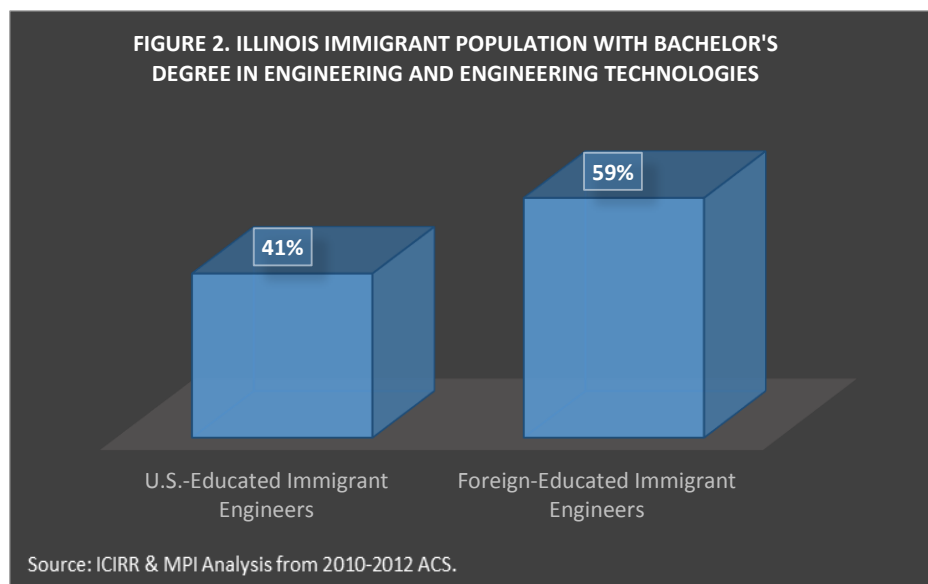
DEMOGRAPHIC PROFILE: FOREIGN-EDUCATED ENGINEERS IN ILLINOIS

As shown in Figure 1, there are 1,533,206 immigrants aged 25 and older in Illinois. Among this group, 241,831 immigrants obtained at least a bachelor's degree abroad (16 percent), while 196,484 earned at least a bachelor's degree in the United States (13 percent).



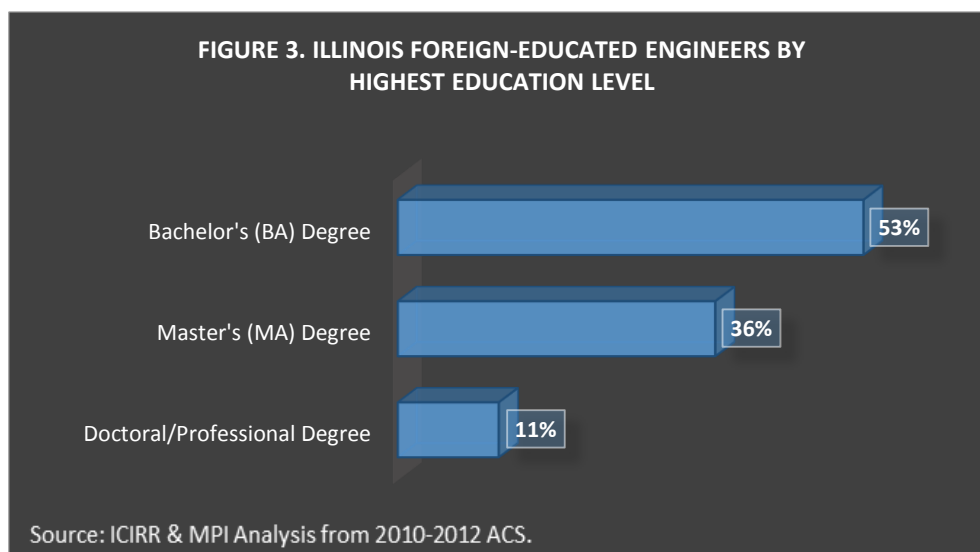
Proportion of Foreign-Educated Engineers

The data also show that Illinois is home to 223,000 engineers and 81,200 (37 percent) of them are immigrants. Of the immigrant engineers, 48,200 (59 percent) are foreign-educated (Figure 2).



Education Level

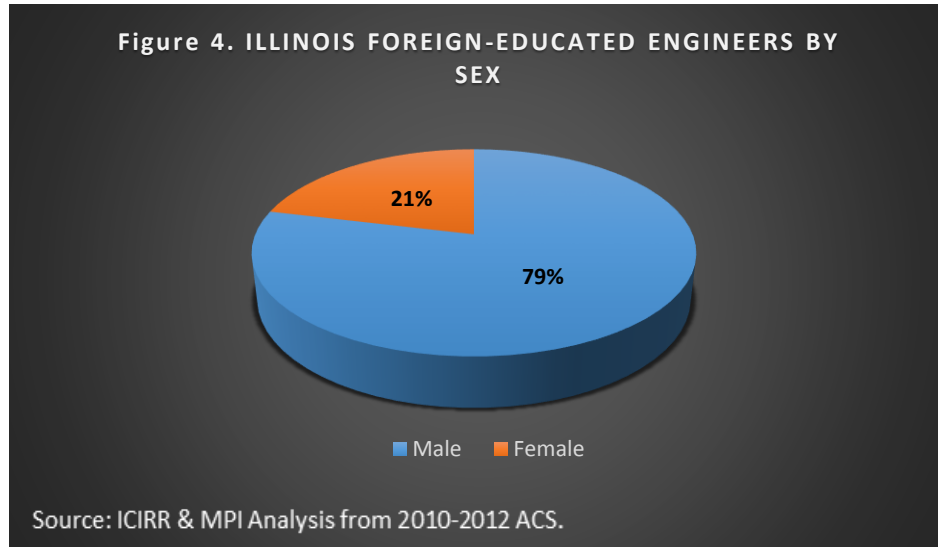
As shown in Figure 3, 53 percent of foreign-educated engineers have earned only a bachelor's degree, 36 percent have a master's degree and 11 percent have a doctoral/professional degree, which shows that this population is highly educated.



Gender

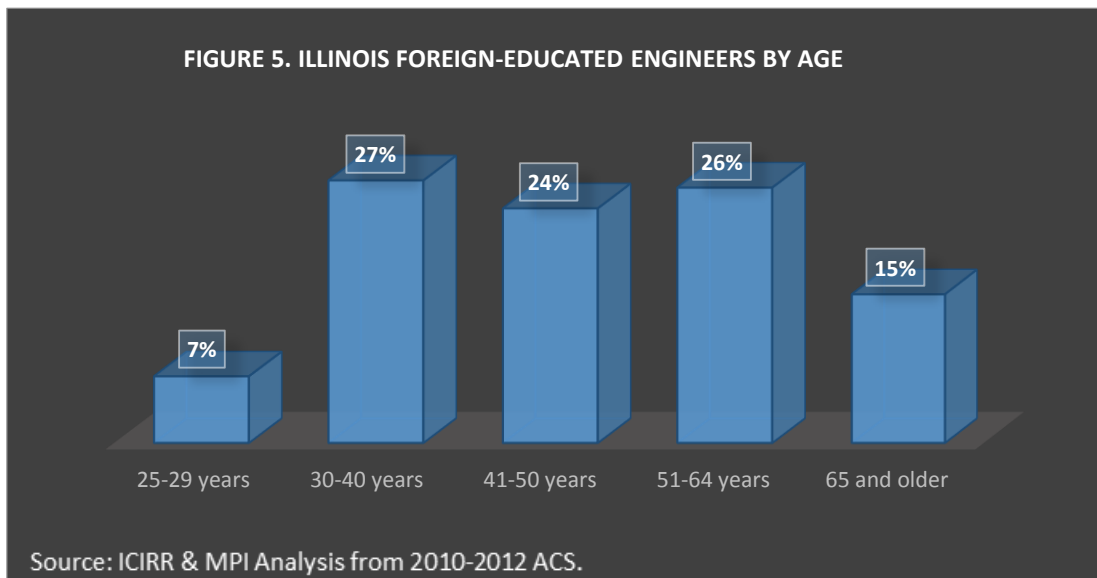
Males are overrepresented among foreign-educated engineers (79 percent), while women only represent less than a quarter (Figure 4). According to a report the U.S. Department of Commerce, *Women in STEM: A Gender Gap to Innovation*, "Women hold a disproportionately low share of STEM undergraduate degrees, particularly in engineering." This disparity has been largely attributed to a lack of female role models with STEM degrees, gender roles, academic curricula (K-12) that discourage women from entering the STEM field, and the lack of family-friendly

policies to accommodate female engineers once they start a family (U.S. Department of Commerce).



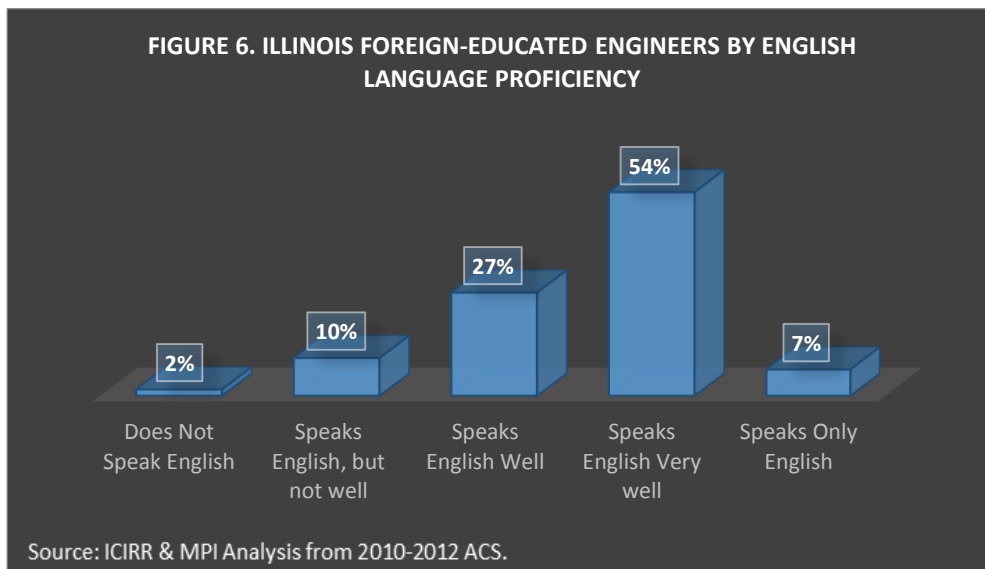
Age

Illinois foreign-educated engineers are mostly older adults. As show in Figure 5, only 7 percent of them are under 30, while 77 percent are between 30 and 64 years old. Although not as large, the percentage of foreign-educated engineers entering old age is still significant (15 percent).

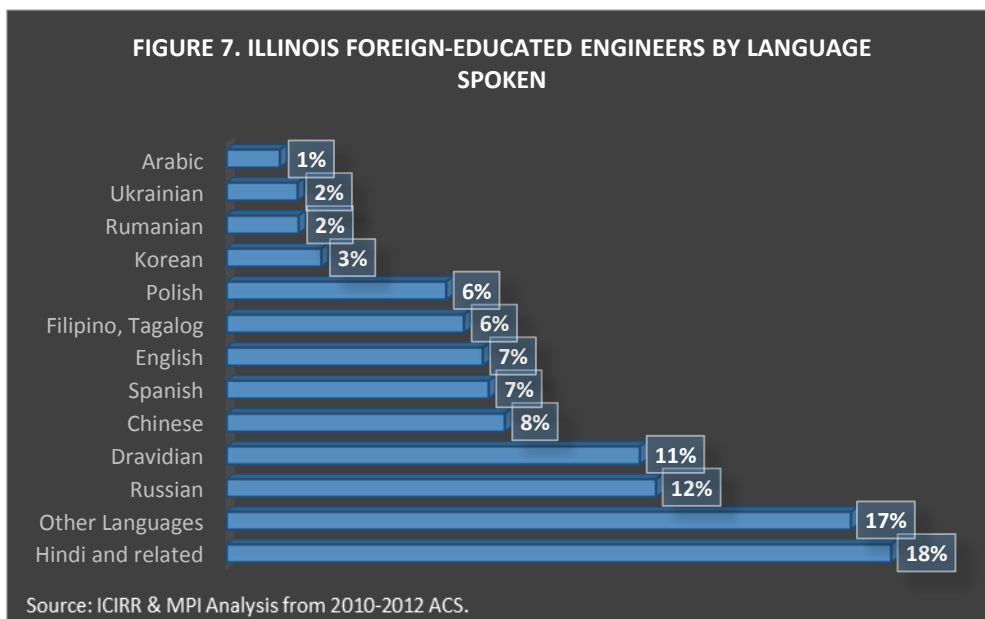


English Proficiency & Other Languages Spoken

The majority of foreign-educated engineers are English Proficient with 54 percent reporting that they speak English very well and 7 percent saying that they speak only English (Figure 6). Another 27 percent speak English well, and only 12 percent do not speak English well or not at all.

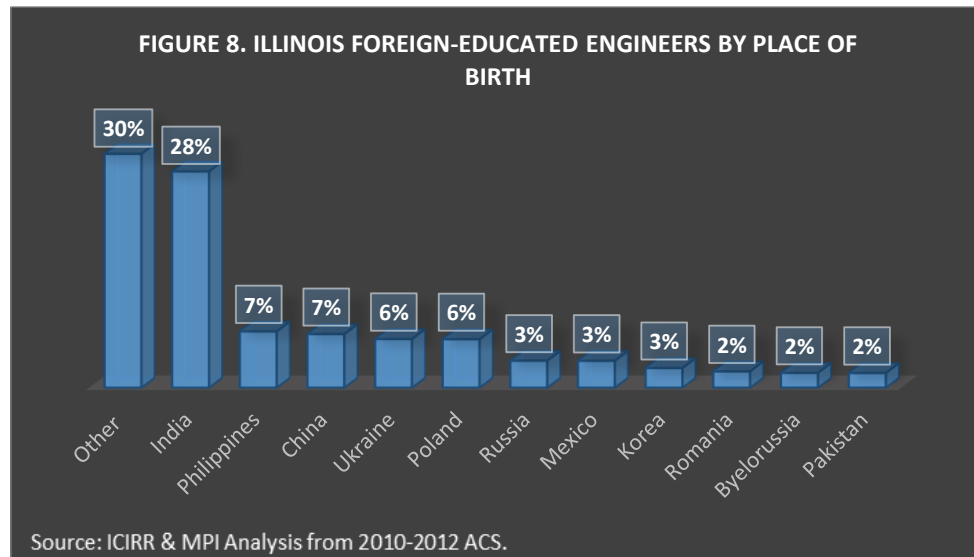


The top four non-English languages spoken among foreign-educated engineers are Hindi and related (18 percent), Russian (12 percent), Dravidian (11 percent), and Chinese (8 percent). The category “Other Languages” contains aggregations of languages that had very small samples and could not be included as separate categories. As Figure 7 shows, the linguistic diversity among foreign-educated engineers is very evident.



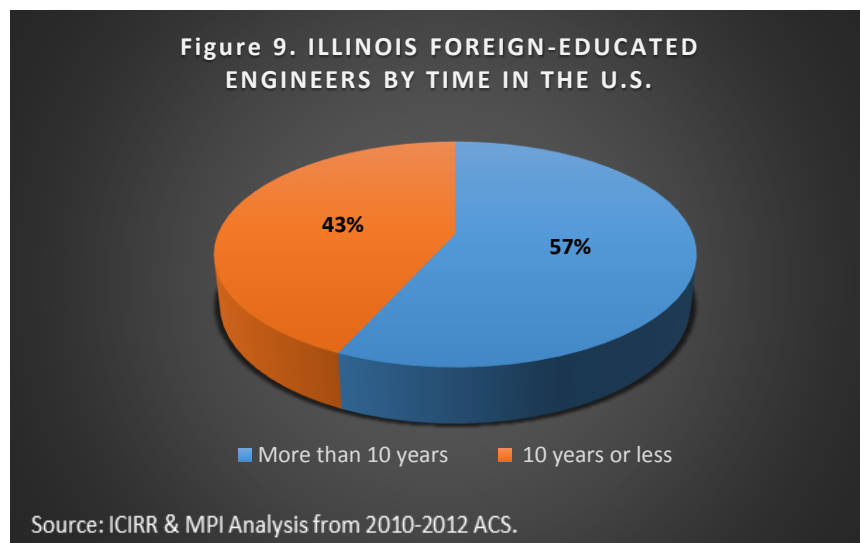
Country of Origin

Having emigrated from various countries, foreign-educated engineers are also very culturally diverse (Figure 8). The top five countries of origin among the immigrant engineers are India (28 percent), Philippines (28 percent), China (7 percent), Ukraine (6 percent), and Poland (6 percent). The category “Other” contains aggregations of countries that had very small samples and could not be included as separate categories.



Length of Time in U.S.

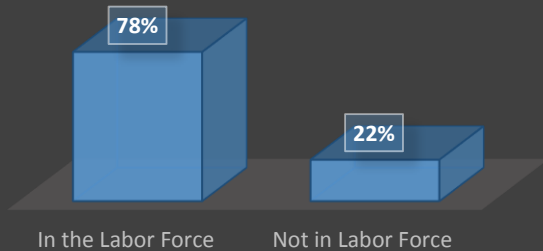
More than half of foreign-educated engineers in Illinois have been in the United States for more than 10 years, while 43 percent of them have been here less than 10 years (Figure 9). Given that a large proportion of them are long-term immigrants, it makes sense that a significant share report being English proficient.



Labor Force Participation

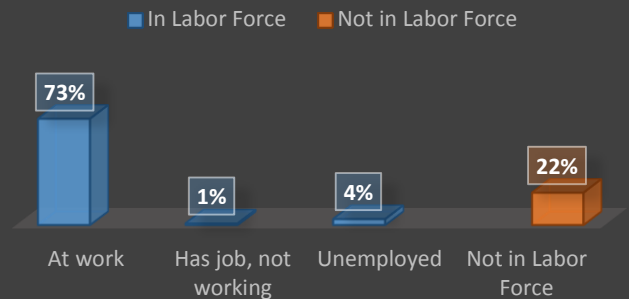
As shown in Figures 10 and 11, foreign-educated engineers are more likely to be in the Illinois workforce than out of it. The overwhelming majority (73 percent) are employed. Whether or not they are employed in the engineering field, foreign-educated engineers are very active in the labor force. In addition, since more than half of them have been in the United States for more than 10 years, it is plausible that they have been able to build networks and support systems that has allowed them to remain in the labor force.

FIGURE 10. ILLINOIS FOREIGN-EDUCATED ENGINEERS BY EMPLOYMENT STATUS



Source: ICIRR & MPI Analysis from 2010-2012 ACS.

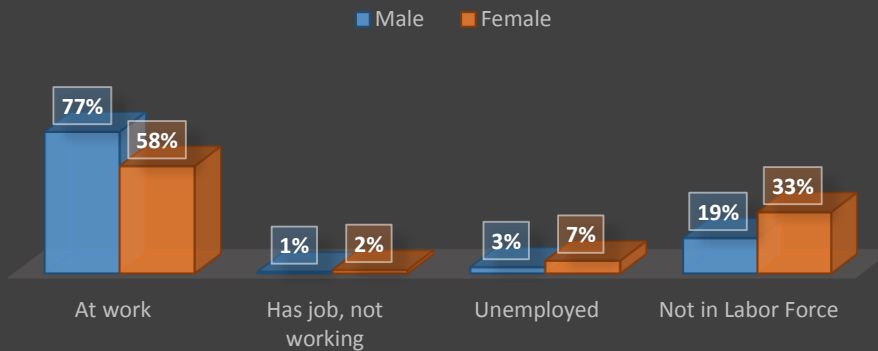
FIGURE 11. ILLINOIS FOREIGN-EDUCATED ENGINEERS BY EMPLOYMENT STATUS, DETAILED



Source: ICIRR & MPI Analysis from 2010-2012 ACS.

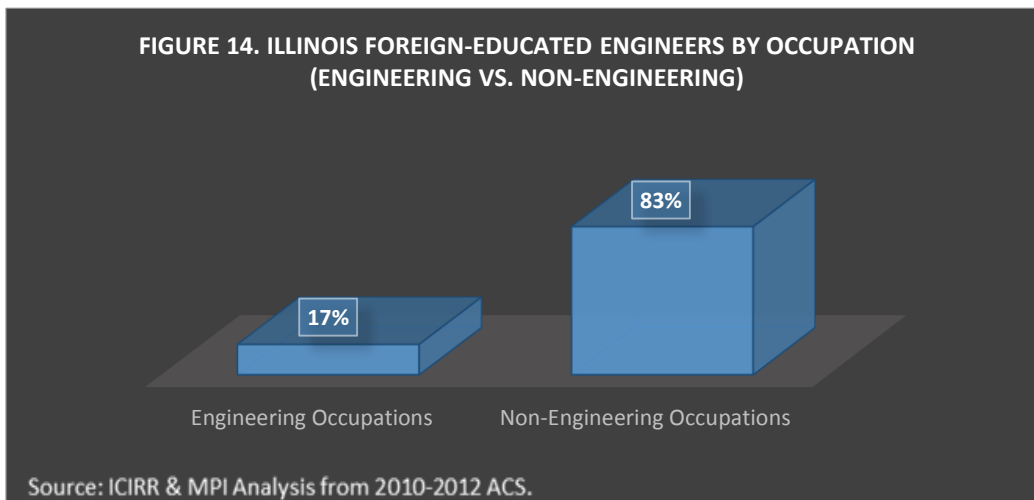
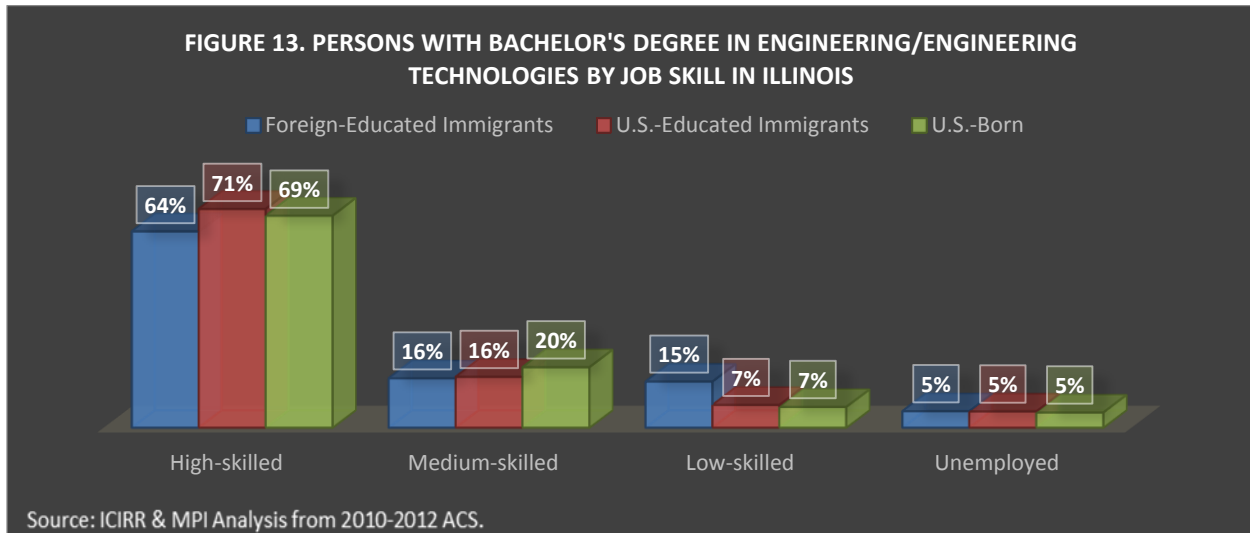
Female foreign-educated engineers are less likely to be employed than their male counterparts (77 percent vs. 58 percent respectively). Consequently, they are twice as likely to be unemployed (7 percent) and out of the labor force (33 percent) compared to male engineers (3 percent and 19 percent). This discrepancy is not surprising due to circumstances and social expectations that often lead women to leave the labor force, such as pregnancy or having to care for a young child or an elderly parent.

FIGURE 12. ILLINOIS FOREIGN-EDUCATED ENGINEERS' EMPLOYMENT STATUS BY SEX



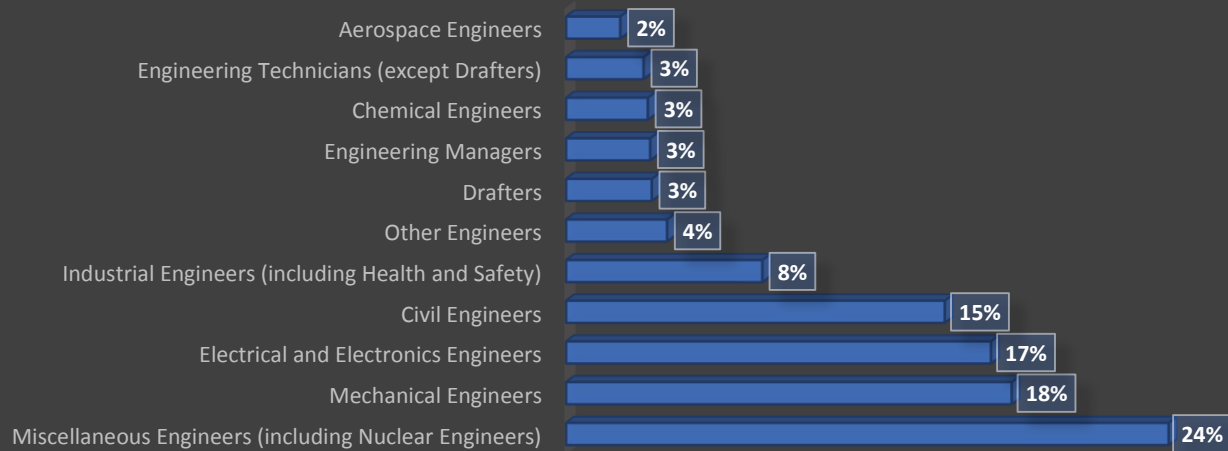
Source: ICIRR & MPI Analysis from 2010-2012 ACS.

As shown in Figure 13, even though 64 percent of foreign-educated immigrant engineers work in high-skilled occupations, 15 percent are employed in low-skilled jobs and 5 percent are unemployed. In other words, no fewer than 20 percent of foreign-educated immigrant engineers in Illinois are not fully using their training. Foreign-educated immigrant engineers are twice as likely to be employed in a low-skilled job (15 percent) as their U.S.-born counterparts (7 percent). Illinois is thus seeing massive “brain waste” among foreign-trained engineers.



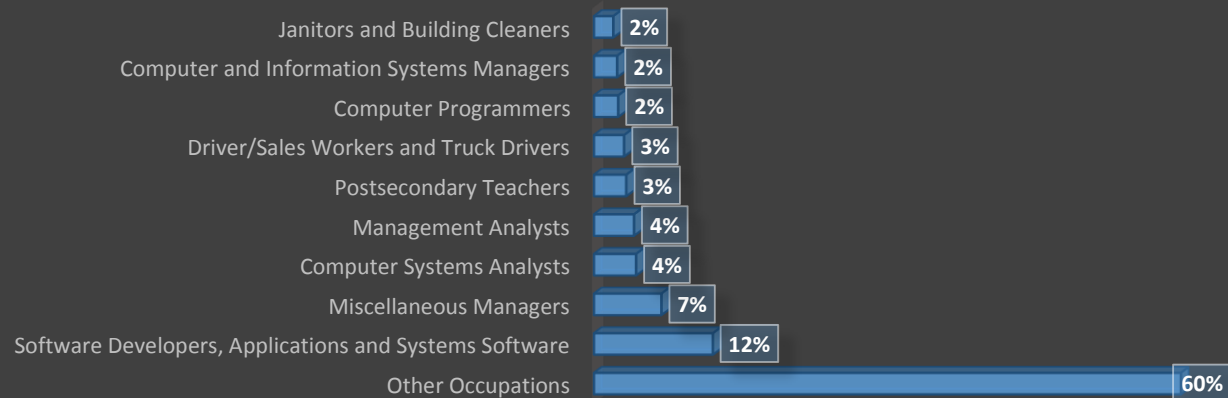
Only one-sixth of all foreign-educated engineers work in engineering occupations (Figure 14). The largest categories of engineering jobs among the foreign-educated are mechanical, electrical/electronic, and civil engineering (Figure 15). Those who do not work in engineering work in a broad range of occupations, with software development and management being the largest categories (Figure 16).

FIGURE 15. ILLINOIS FOREIGN-EDUCATED ENGINEERS BY ENGINEERING OCCUPATION



Source: ICIRR & MPI Analysis from 2010-2012 ACS.

FIGURE 16. ILLINOIS FOREIGN-EDUCATED ENGINEERS BY NON-ENGINEERING OCCUPATION

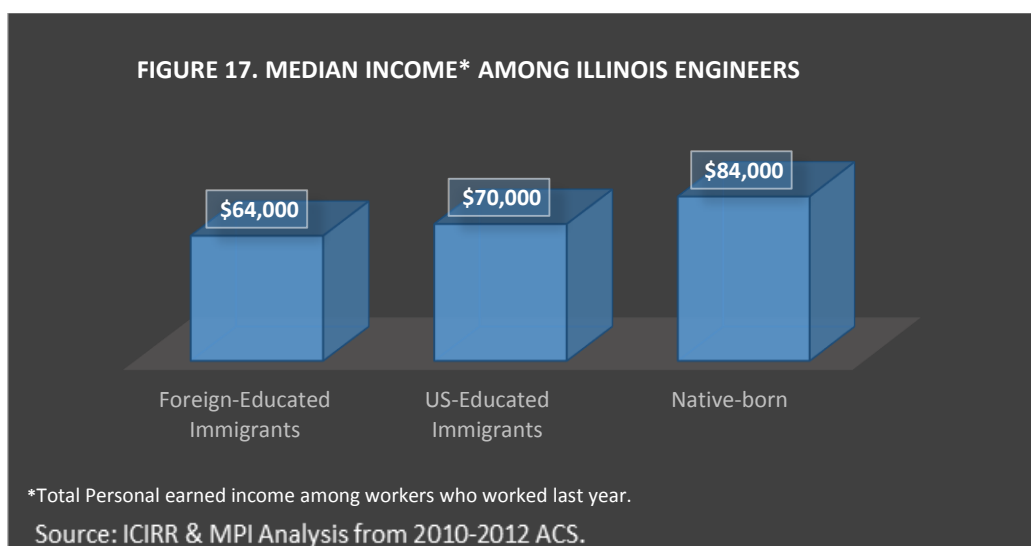


*The category "Other Occupations" contains aggregations of occupations that had very small samples and could not be included as separate categories.

Source: ICIRR & MPI Analysis from 2010-2012 ACS.

Income

Among the foreign-educated engineers who worked last year, their total personal earned income is lower compared to that of U.S.-educated immigrants and US-born engineers (Figure 17). This may be because many foreign-engineers have to enter the engineering field in entry level positions, which lowers their total earned income. Moreover, it is possible that they could be placed in lower-paid positions due to limited English proficiency, number of years working in the U.S., and the ability to prove their credentials and/or their immigration status.



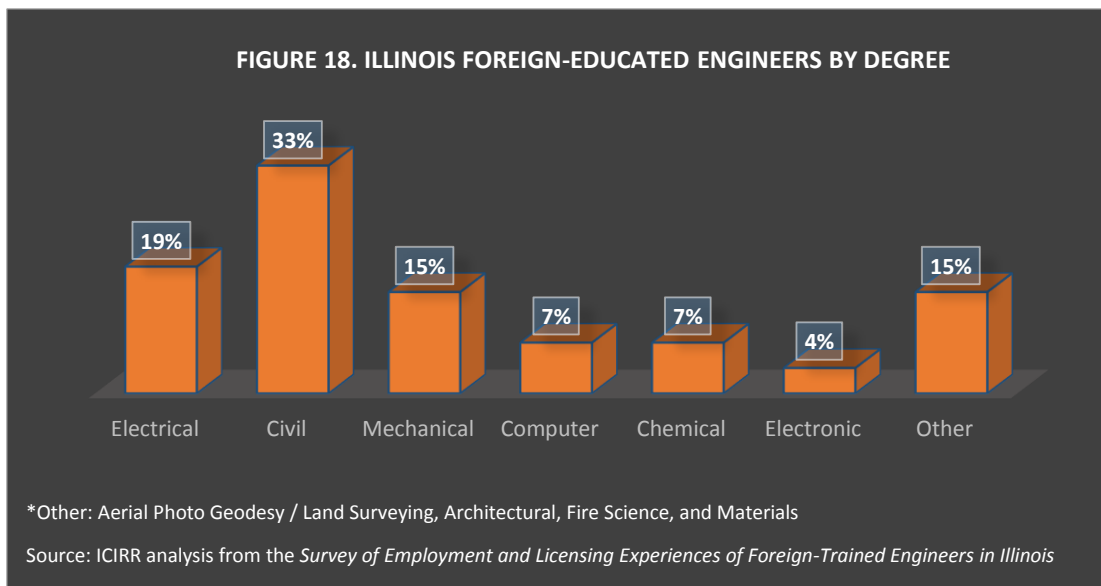
Summary

The foreign-born represent 14 percent of the Illinois population, but 37 percent of all engineers in the state. More immigrant engineers are educated abroad (59 percent) than are educated in the United States (41 percent). Among the foreign-educated, nearly half have earned a master's or doctorate degree (47 percent). Illinois foreign-educated engineers are mostly male (79 percent) and older adults (77 percent). More than half (54 percent) reported being English proficient. They are also linguistically and culturally diverse, representing more than 10 languages and countries. The majority of foreign-educated engineers have lived in the United States more than 10 years (57 percent) and are in the labor force (78 percent). A significant number have high-skilled jobs (64 percent), but most of them are employed in non-engineering occupations (83 percent). Finally, for those who were employed in the engineering profession last year, their median income (\$64,000) is significantly lower compared to that of U.S.-educated immigrants (\$70,000) and native-born engineers (\$84,000).

BARRIERS TO EMPLOYMENT AND PROFESSIONAL RELICENSING FOR FOREIGN EDUCATED ENGINEERS IN ILLINOIS

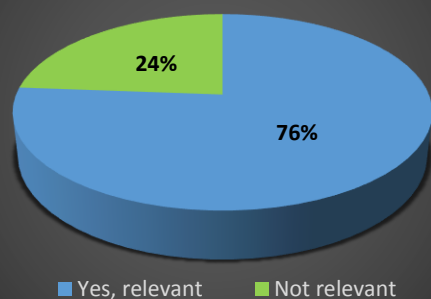
In collaborating with Upwardly Global, ICIRR designed and conducted an online survey to gain a deeper understanding of the barriers to employment and professional licensing that foreign-educated engineers face in Illinois. (*See appendix A for more details.*) The survey results are not representative of the entire population of foreign-educated engineers in Illinois, but the responses provide unique data that illustrate some of the barriers that these engineers have encountered as they try to enter the engineering workforce in Illinois.

Many foreign-educated immigrant engineers are seeking work but face various barriers to accessing the workforce. A large barrier for engineers, particularly civil engineers, is obtaining the professional licensing necessary to lead projects. The plurality of the survey respondents are civil engineers, representing 33 percent of all foreign-educated engineers in the sample (Figure 18).



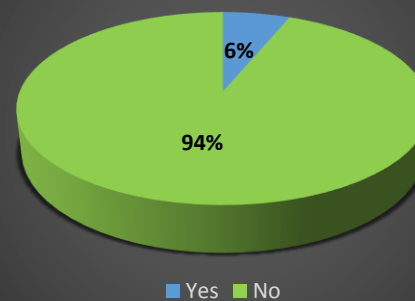
Moreover, according to the survey results, professional licensing is very important for the respondents, with more than three-quarters (76 percent) reporting that it is relevant to their career path (Figure 19). However, only 6 percent of them have tried to obtain the Fundamentals of Engineering (FE) in Illinois, which is the first exam on the licensing pathway (Figure 20).

FIGURE 19. PROFESSIONAL LICENSING RELEVANCE TO ILLINOIS FOREIGN-EDUCATED ENGINEERS' CAREER PATH



Source: ICIRR analysis from the *Survey of Employment and Licensing Experiences of Foreign-Trained Engineers in Illinois*

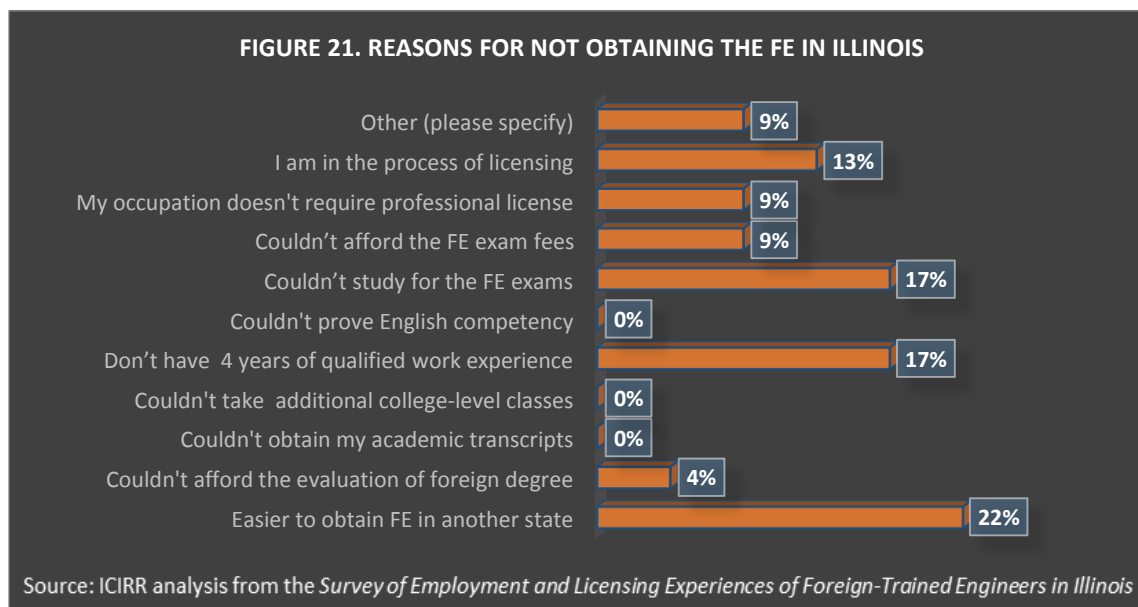
FIGURE 20. PERCENTAGE OF FOREIGN-EDUCATED ENGINEERS WHO TRIED TO OBTAIN FE IN ILLINOIS



Source: ICIRR analysis from the *Survey of Employment and Licensing Experiences of Foreign-Trained Engineers in Illinois*

When asked why they had not obtained an FE in Illinois (Figure 21), the most common response (22 percent) was that it was easier to get the FE in another state: it is common for Illinois-based engineers to sit for the test in Michigan because of different rules affecting individuals with foreign degrees. Other major barriers that survey participants identified as preventing them from obtaining the FE include not having the four years of qualified work experience under a legally practicing engineer (17 percent), not having the opportunity to study for the FE exam (17 percent), and not being able to afford the FE exam fees (9 percent) and the evaluation of their foreign degree (4 percent).

Although no participants identified not being able to prove English competency, take additional college-level classes, or obtain their foreign academic transcripts as barriers to licensing, the fact that the majority of them have not tried to obtain an FE in Illinois shows that they have not reached a point in the application process where they might encounter those barriers. In 2014, Illinois enacted legislation providing that professional engineers, structural engineers, and architects who graduated from programs in non-English-speaking countries and who apply for licenses will no longer need to take the Test of English as a Foreign Language (TOEFL) if they have earned advanced degrees in the US. This legislation (Public Act 98-0993) takes effect January 1, 2015.



Barriers and Recommendations

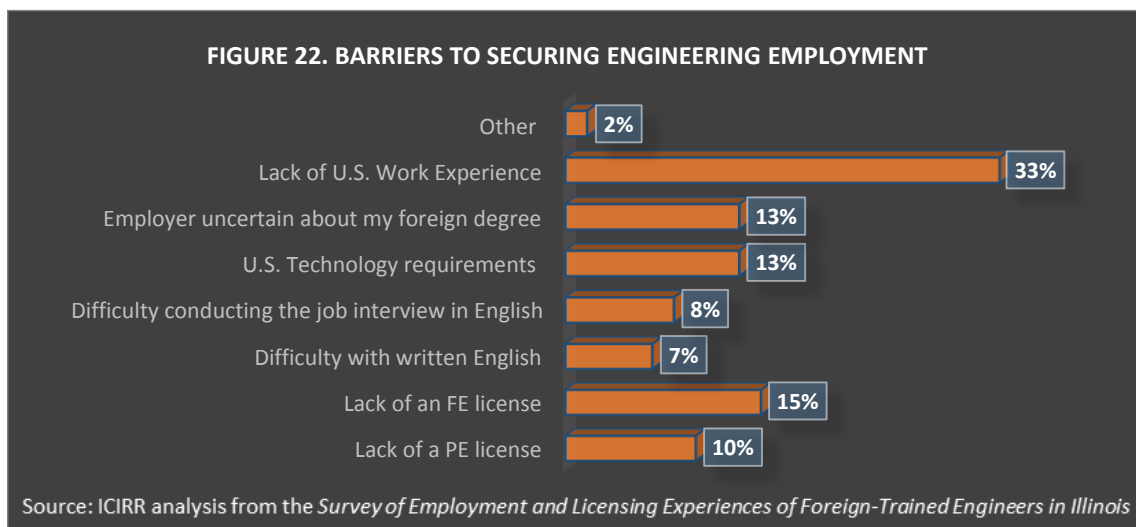
1. Lack of recognized professional experience

Issue:

In Illinois, if an engineer earns a degree from a university that is not accredited by the Accreditation Board for Engineering Technology (ABET)—as is the case for most universities abroad—that engineer must satisfy an additional prerequisite before taking the first exam on the licensing pathway, Fundamentals of Engineering (FE): the engineer must submit proof that she worked under a U.S. licensed engineer for four years. This requirement proves to be a barrier for engineers with foreign experience for several reasons. First, they may have several years of experience, but work outside of the United States is unlikely to have been under a U.S. licensed engineer. Second, they may not be able to obtain proof of employment due to the circumstances under which they left their home country. This is especially true for refugees and asylees.

Third, when these engineers are required to obtain U.S. work experience, several factors combine to make it very difficult for them to obtain a job in engineering. The top five barriers identified by our survey participants were lack of U.S. work experience (33 percent), lack of FE license (15 percent), employer uncertainty about their foreign degree (13 percent), U.S. technology requirements (13 percent), and lack of PE license (10 percent) (Figure 22). The issue

here is that the foreign-educated engineers need to get hired to start accumulating U.S. work experience, but they cannot get hired because they do not have any U.S. work experience to begin with. As Peter A. Creticos (2007) mentions in the report *Employing Foreign Educated Immigrants*, “Foreign-educated immigrants seeking to re-establish their careers often face a chicken versus the egg problem of needing U.S. work experience in order to qualify for a job.”



Finally, employers are often hesitant to hire foreign-educated engineers because many of them believe that most immigrants are not qualified to work legally in the United States and will need to file a petition for an employment-based visa or green card. In fact, most of these foreign-educated engineers are legally authorized to work in the United States. All of our survey respondents in the sample reported being lawful permanent residents, which shows that, in many cases, employers do not have to deal with immigration-related procedures.

The Illinois FE requirement of four years of experience working under a U.S. licensed engineer thus creates major hurdles for foreign-educated engineers who want to become licensed in our state. Other states, including Michigan and California, do not have this experience prerequisite for the FE exam and thus allow foreign-educated engineers to begin the relicensing process as soon as they are ready for the FE exam. Currently, job seekers are leaving Illinois to relicense in other states, resulting in a loss of professional skills and talent for Illinois. In a 2009 survey of immigrants in regulated professions Upwardly Global found that 43 percent of participants would seriously consider moving to another state that offered better opportunities to become licensed to practice their profession.

Recommendations:

- The Illinois Department of Financial and Professional Regulation (IDFPR) should
 - adjust FE work experience prerequisites to allow more access and retain professionals in Illinois.
 - create faster pathways to licensing with more emphasis on supervised limited practice and/or applied skills tests. (A precedent for such pathways is foreign dentists in some jurisdictions being able to take clinical skills tests or "bench

exams" where they are observed doing dentistry in a controlled environment, or foreign-educated lawyers being allowed to take the bar exam in some states with a one-year Master of Laws or LL.M. degree instead of the 3-year Juris Doctor degree.)

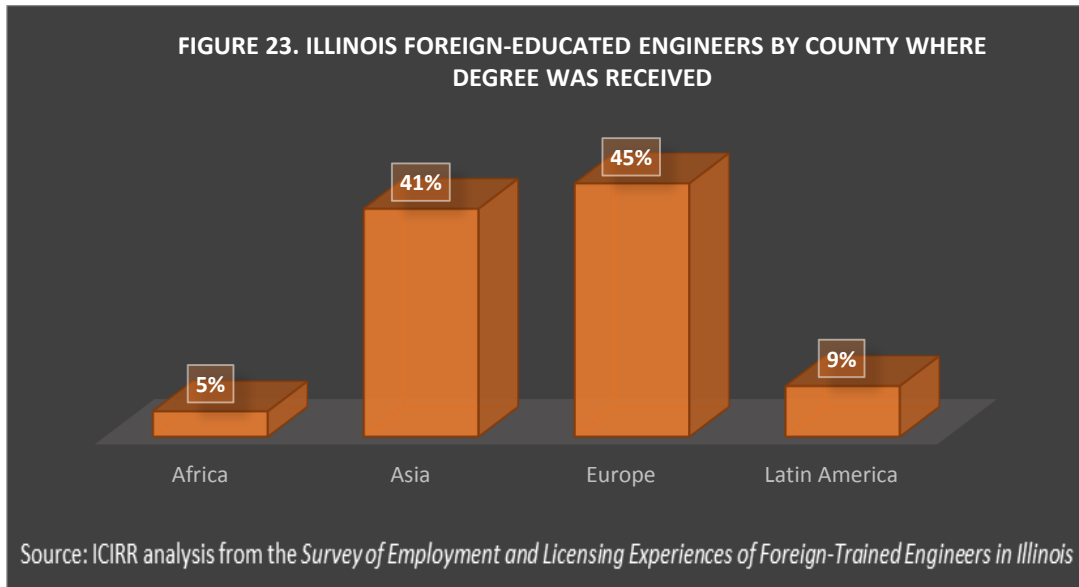
- Government agencies, such as the Illinois Department of Financial and Professional Regulation (IDFPR), Illinois Department of Employment Security (IDES), the Illinois Department of Commerce and Economic Development (DCEO), the Diversity Enrichment Program (DEP) at the Illinois Department of Central Management Services (CMS), and the Chicago Cook Workforce Partnership, should develop programming to assist foreign-educated engineers with licensing in exchange for several years of work in an underserved area or public service within the state.
- The American Council of Engineering Companies of Illinois (ACEC-IL), engineering firms, and organizations supporting high-skilled immigrant integration and development (Upwardly Global, Governor's Office of New Americans, City of Chicago Office of New Americans) should
 - collaborate to create or expand internships for foreign-educated engineers to give them the opportunity to enter the engineering field and start obtaining US work experience.
 - create opportunities, such as networking and informational events, to connect engineering firms with foreign-educated engineers and create awareness about the importance and benefits of having access to a pool of talented immigrant engineers.
- State government agencies and foundations should provide financial support for organizations that support foreign-educated engineers in their search for employment and the re-licensing process (i.e. Upwardly Global).

2. Degree evaluation

Issue:

Engineers who did not get their degrees from an ABET accredited institution must have ABET evaluate their degrees before they can take the FE. Similar to the experience prerequisite, this requirement poses significant barriers for foreign-educated engineers. The materials (such as transcripts) need to be sent directly from the school issuing the degree to the credentials evaluation service at the National Council of Examiners for Engineering and Surveying. For refugees or asylees, who fled their country for safety reasons often due to war or political turmoil, locating and retrieving the documents can be a lengthy process.

As shown in Figure 23, many of the survey respondents obtained their degrees in Asia (41 percent), a region that includes countries, such as Iraq, that have been experiencing war and its aftermath for years. The institutions in those countries may be difficult to access, the government of their home country may create barriers, and the process to secure documentation is often complex and time consuming.



As with the professional experience prerequisite, other states such as Michigan do not require that the degree is evaluated *before* taking the FE exam. The degree evaluation is still required to obtain the Professional Engineering license (PE), but can occur after the FE exam. This allows foreign-educated engineers to sit for the FE exam and obtain work as an Engineer Intern (EI) earlier in the process, providing much needed income to support the licensing process and contribute much needed skills to our economy.

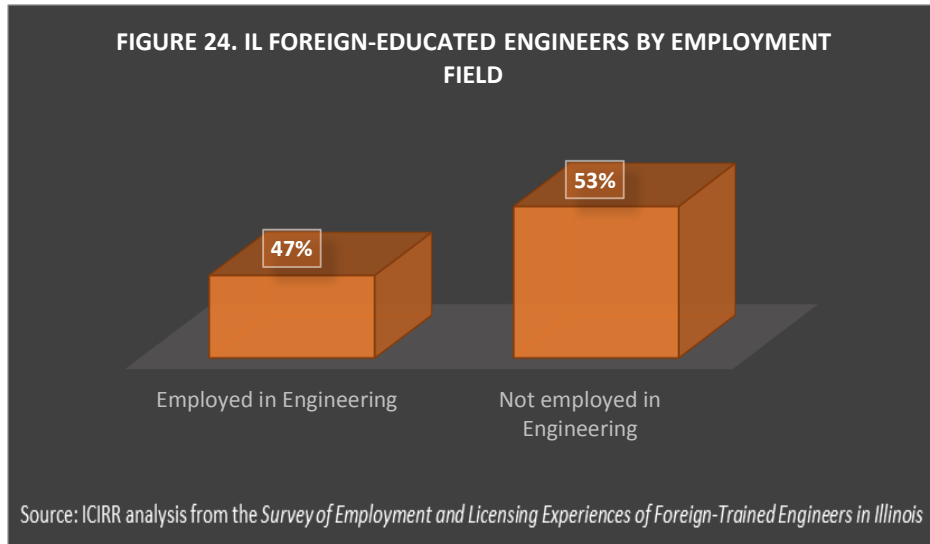
Recommendation:

- The Illinois Department of Financial and Professional Regulation (IDFPR) should change the requirement so that education credential prerequisites are tied to the PE exam instead of the FE.

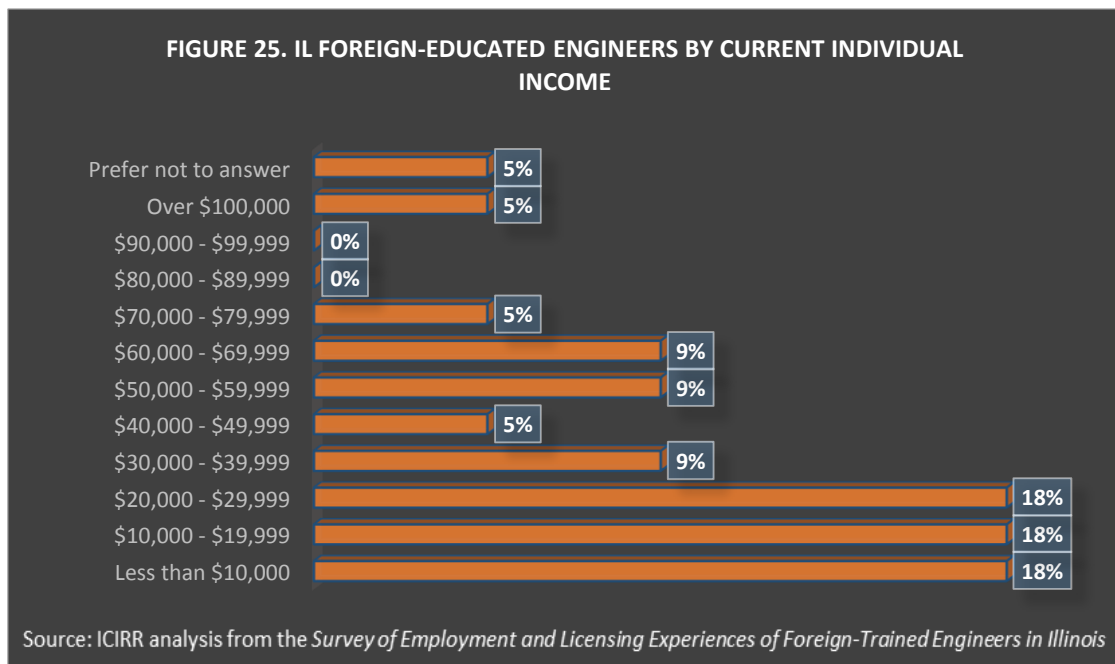
3. Financial Burden of Licensing

Issue:

According to licensing guides published by Upwardly Global, the estimated costs of becoming a professional engineer in Illinois vary from \$3,400 to \$12,200. The cost covers applying and registering for exams, obtaining degree evaluation, translation of materials if necessary, paying for courses to fill in gaps identified in the foreign degree evaluation, and test preparation costs (for courses, study materials, and other items). The financial aspect of licensing is a large barrier particularly for foreign engineers who may have limited savings or had to leave their home country under duress. As a result, these engineers with years of work experience are underemployed, working survival jobs that only cover the cost of living while putting licensing on the back burner. According to the survey results, more than half of the respondents (53 percent) are employed in non-engineering occupations (Figure 24).



In a survey of immigrants in regulated professions conducted in 2009 by Upwardly Global, 53 percent of those surveyed earned less than \$25,000 and 38 percent must either slow down or interrupt their licensing process due to money issues. Similarly, in our survey 54 percent of the participants earned less than \$30,000 (Figure 25). Unfortunately, the longer an engineer is out of the field the more difficult it becomes to re-enter an engineering career, creating a loss for the individual and the Illinois workforce.

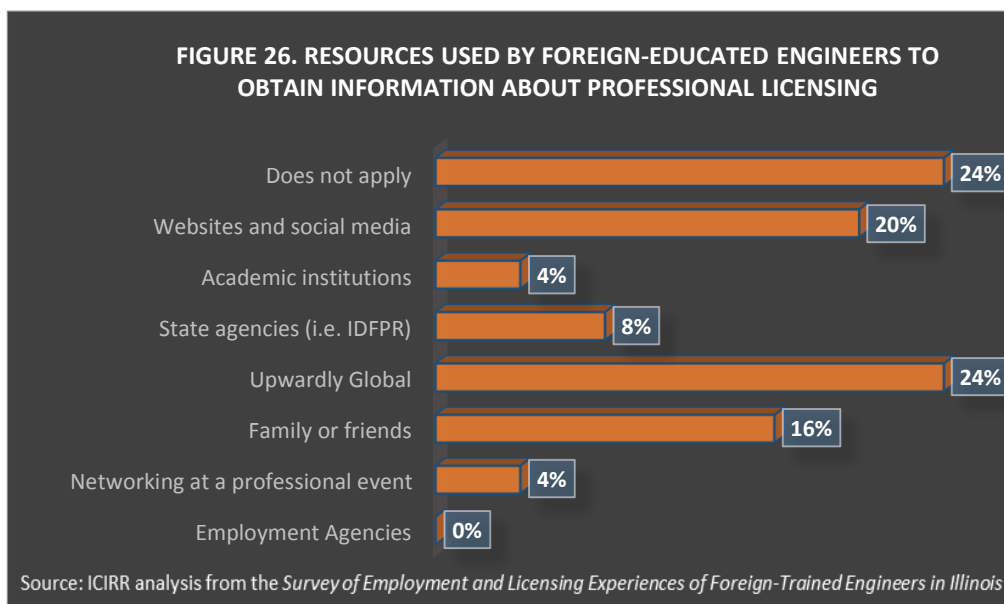


Recommendations:

- The set of recommendations identified in the first two sections should be implemented to allow engineers to work in their field sooner, earn higher incomes, and alleviate some of the financial burden of relicensing.
- In addition, microlending should be considered to help foreign-educated engineers with their licensing costs. Upwardly Global is piloting such a program with the New York City Economic Development Corporation. The Immigrant Bridge Loan Fund makes loans of \$1,000 to \$10,000 to qualified high-skilled immigrants to cover licensing fees, training classes, and other necessary expenses.

4. Licensing Process Navigation

Issue: Navigating the licensing process can be intimidating and poses a challenge for engineers seeking to relicense. The state's online resources are unclear, particularly for foreign-educated engineers, and finding necessary information becomes a barrier. In fact, in our survey only 8 percent of the respondents have used state agencies, such as the Illinois Department of Financial and Professional Regulation (IDFPR), to obtain information about the professional licensing process (Figure 26) compared to other sources of information like Upwardly Global (24 percent), websites and social media (20 percent) and family or friends (16 percent). Clearly, foreign-educated engineers do not feel comfortable using State agencies as a resource, even though these agencies should be the primary source of information regarding the licensing process.



Once the steps are understood, the complexity proves discouraging to some. Over 80 percent of immigrants surveyed by Upwardly Global in 2009 expressed that in exchange for help in navigating the licensing process, they would be willing to work in a public service position, a lower paid position, or in an underserved community for a set number of years.

Recommendations:

- The Illinois Department of Financial and Professional Regulation (IDFPR) should
 - track and study foreign-educated immigrant licensing inquiries and attempts vs. success rates to identify points of drop-out, and measure the impact of pro-licensing policies over time; and
 - include and promote the Upwardly Global licensing guides designed for immigrants in its website and resources.

Summary

ICIRR and Upwardly Global envision a United States where foreign-educated engineers are a recognized and valued source of talent. Enabling these engineers to work in their chosen field would provide global talent for employers, culturally competent service providers for diverse communities, and family sustaining incomes for those who were previously unemployed or underemployed. The barriers we have described in this report are complex, but not impossible to overcome. Solutions will require the coordination of various stakeholders as well as a strong commitment to supporting these new Americans and giving them an equal opportunity to find and secure skill-appropriate opportunities and achieve their full economic potential in the United States.

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REFERENCES

- Batalova, Jeanne, Michael Fix, and Peter A. Creticos. 2008. *Uneven Progress: The Employment Pathways of Skilled Immigrants in the United States*. Migration Policy Institute. Retrieved March 13, 2014 (<http://www.migrationpolicy.org/research/uneven-progress-employment-pathways-skilled-immigrants-united-states>).
- Creticos, Peter A., Michael Fix, Jeanne Batalova, Amy Beeler, and Rob Paral. 2007. *Employing Foreign Educated Immigrants*. Rob Paral and Associates. Retrieved March 13, 2014 (http://www.robparal.com/downloads/Employing_Internationally_Educated_Final.pdf).
- Hilkevitch, Jon. 2013. "Illinois infrastructure fails to make the grade." *Chicago Tribune*, March 19. Retrieved March 13, 2014 (http://articles.chicagotribune.com/2013-03-19/news/ct-met-illinois-infrastructure-report-card-0319-20130319_1_infrastructure-new-report-card-civil-engineers).
- Illinois Department of Employment Security, Economic Information & Analysis Division. n.d. *State of Illinois Occupational Employment Projections (Long-term), 2010-2020*. Illinois Department of Employment Security. Retrieved March 13, 2014 (<http://www.ides.illinois.gov/Custom/Library/Statistic/EmploymentProjections/IL1020LTOcc.PDF>).
- Matthew, Dixon. 2013. *Skills, Professional Regulation, and International Mobility in the Engineering Workforce*. Migration Policy Institute. Retrieved March 13, 2014 (<http://www.migrationpolicy.org/research/skills-professional-regulation-and-international-mobility-engineering-workforce>).
- Ruggles, Steven, J. Trent Alexander, Katie Genadek, Ronald Goeken, Matthew B. Schroeder, and Matthew Sobek. 2010. "Integrated Public Use Microdata Series: Version 5.0 [Machine-readable database]." Minneapolis, MN: Minnesota Population Center [producer and distributor].
- Upwardly Global. 2014. "ILLINOIS ENGINEER (PE) PROFESSIONAL LICENSING GUIDE." Retrieved March 13, 2014 (<http://www.upwardlyglobal.org/job-seekers/american-licensed-professions/illinois/illinois/engineer>).
- Brennan, Jennifer. 2009. "Upwardly Global Foreign-Educated Immigrant Survey: Data Summary." Unpublished tabulations, Upwardly Global, New York, NY.
- U.S. Department of Commerce. 2011. *Women in STEM: A Gender Gap to Innovation*. U.S. Department of Commerce. Retrieved March 13, 2014 (<http://www.esa.doc.gov/sites/default/files/reports/documents/womeninstemagaptoinnovation8311.pdf>).

APPENDIX A

The *Survey of Employment and Licensing Experiences of Foreign-Trained Engineers in Illinois* was conducted by ICIRR and Upwardly Global via e-mail throughout March 2014 (survey questionnaire available upon request). We selected Upwardly Global's client database as our sample, which included 66 foreign-educated engineers. Many of them are seeking employment or licensing in engineering, while others have already entered the field or began the process to relicense. We received a total of 36 responses, but 15 of those were eliminated because they were duplicates or incomplete. A total of 21 complete responses were included in our final analysis for this report. Given the low response rate (32 percent), the survey results are not representative of the entire population of foreign-educated engineers in Illinois. Nonetheless, the responses provide unique data that illustrate some of the barriers that foreign-educated engineers have encountered as they try to enter the engineering workforce in Illinois.