Summary
The five million workers employed in science and engineering (S&E) occupations, and the 20 million with S&E degrees, are considered keys to US competitiveness in the 21st century. Most of those earning advanced degrees in S&E fields at US universities are foreigners. Many US employers assert that the US government limits their economic competitiveness with quotas that restrict admissions of H-1B temporary foreign workers and immigrant visas or green cards for foreigners whom employers find best qualified to fill jobs.

President Barack Obama and Republican challenger Mitt Romney disagree about most immigration-related issues, but both support increasing the number of temporary worker and immigrant visas for highly skilled S&E workers. Universities, Bill Gates and many academics urge the government to open doors wider for foreign students and workers in S&E fields, prompting the question, should admissions be linked to the ever-changing demand for S&E workers? A group of 30 experts dealt with this question by reviewing four major issues:

- Do US students respond to wage signals and move into S&E fields with rising earnings and away from fields with declining earnings?
- Are foreigners more innovative and entrepreneurial than natives?
- How could the US government improve the allocation and management of immigrant and temporary worker visas for employers of S&E workers?
- Could an expert commission monitor US labor markets and adjust the number of employment-related visas better than the current system, which fixes quotas in law?

S&E Students and Signals
Scientists create knowledge and engineers apply knowledge. US pupils and students are interested in S&E, many earn S&E degrees, but far fewer ever work in S&E occupations. Why is there so much attrition or “diversion” from S&E interests and degrees to non-S&E occupations?

There are many reasons why individuals move away from S&E, including the fact that many engineers and life scientists urge their children NOT to enter these fields. Engineering is a cyclical industry, laying off workers in busts and
preferring to hire fresh graduates during booms, so that careers in engineering may be relatively short. Those holding advanced degrees in the life sciences may work up to a decade as post docs earning less than $50,000 a year, reducing their lifetime earnings.

High-ability students who can complete S&E degrees may elect to study business, law or medicine, fields that offer higher lifetime earnings. However, students do respond to market signals, as illustrated by the increase in enrollments in petroleum engineering, where entry-level wages topped $85,000 in 2011, reflecting demand with new oil shale projects. The number of US students in petroleum engineering tripled in less than three years, suggesting that market signals (wages) attract students.

Those who nonetheless want the US government to expand the number of US and foreign S&E students and workers agree that yes, market factors affect student choices and job searches, but S&E training is nonetheless fundamental to competitiveness and should be encouraged for its own sake. They argue that those who earn S&E degrees but do not work in S&E occupations nonetheless find other jobs, perhaps in health care. Some S&E graduates leave S&E occupations to move into management, which prompts some analysts to suggest that the abilities needed to earn S&E degrees are useful in other occupations. However, even if S&E degrees are useful in a wide variety of fields, there is more attrition between S&E degree and S&E occupation than might be expected.

Government policies heavily influence the supply of and demand for S&E students and workers. Government scholarships and research grants support much of the graduate education in S&E fields, and government spending, from defense to space, shapes the demand for S&E workers. Migration policy primarily affects supply, helping to govern admissions and support for S&E students and determining how many foreign S&E workers to admit.

**Are Foreigners More Innovative?**

Even if US students respond to S&E market signals and enroll in fields that offer rising salaries, there is another argument for opening doors wider to foreign S&E students and workers: foreigners may be more innovative. Groups such as the Partnership for a New American Economy led by New York Mayor Michael Bloomberg argue that foreigners obtain patents at a higher rate than US-born workers. President Obama has several times lamented the departure from the US of foreign students who earned degrees from US universities, prompting proposals to “staple immigrant visas to degrees of foreign S&E graduates.”

A well-known statistic is that half of Silicon Valley start-ups have at least one immigrant co-founder. What is less well-known is that two-thirds of the employees of Silicon Valley firms are foreign-born, which casts a different light on entrepreneurship and innovation among foreign-born US residents. Studies of entrepreneurship and innovation among foreign-born US residents reach a similar conclusion: the more careful the study, the less likely it is to conclude that immigrants are more entrepreneurial or more innovative. Many of the studies
confuse composition and rates. About 13 percent of US residents are foreign born. However, the foreign-born are more than 13 percent of PhDs in the S&E fields where patents are most common, so it is no surprise that they should be associated with more than 13 percent of patents granted in S&E fields.

Similarly, entrepreneurship is often measured by self-employment. However, a low-skilled worker whose lack of English encourages him to employ himself to sell fruit from a cart is far different from a cofounder of Google. The well-known role of foreign-born workers in Silicon Valley, a small but important slice of the US economy, likely shapes impressions that the foreign-born are more entrepreneurial and innovative than natives.

Allocating Visas

Sovereign governments regulate the entry and stay of foreigners. US immigration law is complex, but its study and employment provisions generally allow universities and employers to begin the process of admitting particular foreigners to study and work, that is, private actors open doors to the US. Universities decide whom to admit, and foreigners use their admission letters to obtain visas, just as employers request visas for particular foreign workers. The government role in both cases is to say yes or no to particular requests.

The H-1B program provides 65,000 visas a year for foreigners with a Bachelor’s degree, 20,000 for foreigners who have earned MS and PhD degrees from US universities, and an unlimited number for universities and nonprofits (the 65,000 cap was raised to 195,000 between 2001 and 2003). From 2003 to 2007, employers requested all of the 65,000 H-1B visas for Bachelor’s degrees soon after they were available and urged Congress to raise or abolish the H-1B quota. For FY13, which begins October 1, 2012, employers had requested the 65,000 and 20,000 H-1B visas by June 2012.

All foreign graduates of US universities are allowed to remain for 12 months to engage in Optional Practical Training, which is employment directly related to the student’s field of study. After President Obama pointed to US-trained S&E graduates having to leave the US because there were too few H-1B visas available, DHS in April 2008 responded by extending OPT from 12 to 29 months for foreigners who earn degrees in STEM fields. The extended OPT gives employers more opportunities to obtain H-1B visas for foreign STEM graduates of US universities, helping to alleviate the perceived “shortage” of STEM workers.

Critics of extending OPT for STEM graduates point to several issues, including the ever-expanding list of STEM occupations and the fact that employers of OPT foreigners do not pay social security and other payroll taxes on their wages, which may give some an economic incentive to hire foreigners over Americans. Critics also emphasize that, when US quotas on H-1B visas are locked into international agreements such as the GATS, their number cannot be reduced when the economy sours without violating GATS commitments.
Managing Migration

The goals of US migration policy include allowing employers to hire the workers they think best to fill particular jobs and to protect and enhance the wages of US workers. Migration policy balances these competing interests by making it relatively easy for US employers to hire foreign workers temporarily as guest workers and to obtain immigrant visas for settlers, and policy aims to protect US workers by capping the number of visas available.

The question is whether there are better ways to (1) determine the number of visas to make available and (2) allocate them. The major proposal for determining numbers is an independent commission to study the labor market and recommend the number of immigrant and guest worker visas for a year or more, making adjustments as economic and labor market conditions change. Most proposals for a commission are long on how to appoint independent commissioners and the nature of their recommendations and short on examples of how commission staff would use available top-down and bottom-up data and evidence to recommend the optimal number of visas.

A commission would likely look at why employers say there is a labor shortage that requires foreign workers and whether migration is a sensible response to perceived shortages. Deciding whether there is a labor shortage could involve looking at (1) why the demand for labor exceeds supply, whether because demand increased faster than supply or whether supply responds slowly to increased demand because of required training, (2) whether demand was stable but supply decreased with retirements etc, or (3) whether there are restrictions on wages or training institutions that discourage or restrict entry into the occupation, as with a reported lack of instructors to train US nurses. Instead of or in addition to foreign workers, a commission might recommend that employers increase recruitment efforts, raise the productivity of current workers, hire less-skilled workers and train them, or raise wages and improve benefits to attract more workers.

Given a number of visas, how should they be allocated if demand exceeds supply? Currently, the US uses a first-come, first-served procedure, with a lottery to select visa winners if all available visas are requested soon after they become available, as with H-1B visas in some years. Further frustrating employers, the current system does not allow them to establish a priority list of the foreigners for whom they are requesting H-1B visas, so an employer requesting 10 H-1B visas may win visas for their 9th and 10th selections but not numbers one and two. Immigration lawyers reportedly opposed USCIS plans to allow employers to submit skeletal applications for H-1B visas, and full applications only for those selected in the H-1B lottery, since such a two-step procedure could have reduced current fees of $3,000 per H-1B application.

Another way to allocate visas when demand exceeds supply is with auctions that award visas to the highest bidder. Auctioning visas could raise money for the government that now flows to immigration lawyers and advisors. Auctions raise operational questions, including whether there would be minimum or
reservation fees, whether both employers and workers could bid for visas, and how to prevent gaming the auction, as when immigration advisors bid for visas to distribute to the employers who actually hire the workers. There are also concerns that auctions could lead to a form of indentured servitude, as employer auction fees were deducted from worker pay.

Conclusions
Both President Obama and challenger Romney believe that foreign S&E workers are critical to US competitiveness and that current policies for managing the entry of foreign S&E students and workers are flawed. Both appear to support increasing the number of visas available to employers who want to hire foreigners with S&E degrees and to STEM graduates who want immigrant visas.

Participants acknowledged the considerable dis-satisfaction with the current system for admitting STEM workers, but also skepticism that a commission could do better. Keeping quotas constant during the 2008-09 recession, for example, was cited as an example of the problems of locking quotas into law. Employer requests for temporary foreign workers fell during recession, but not for employment-based immigration visas because of backlogs. Many participants asserted that, if federal agencies and commissions collected and analyzed immigration and labor data, they could provide Congress with the information needed to improve migration policy making, making a commission unnecessary. Some felt that elected representatives accountable to voters are better decision makers than unelected commissioners.