Introduction

William R. Kerr, *Harvard Business School and NBER*

Josh Lerner, *Harvard Business School and NBER*

Scott Stern, *MIT and NBER*

This volume is the fifteenth annual volume of the National Bureau of Economic Research (NBER) Innovation Policy and the Economy (IPE) group. The appreciation of the importance of innovation to the economy has increased over the past decade. There is an active debate regarding the implications of technological change for economic policy and the appropriate policies and programs regarding research, innovation, and the commercialization of new technology. This debate has only intensified as policymakers focus on new sources of innovation and growth in light of the recent economic downturn and the associated focus on enhancing employment and growth.

The IPE group seeks to provide an accessible forum to bring the work of leading academic researchers to an audience of policymakers and those interested in the interaction between public policy and innovation. Our goals are:

• to provide an ongoing forum for the presentation of research on the impact of public policy on the innovative process;
• to stimulate such research by exposing potentially interested researchers to the issues that policymakers consider important; and
• to increase the awareness of policymakers (and the public policy community more generally) concerning contemporary research in economics and the other social sciences that usefully informs the evaluation of current or prospective proposals relating to innovation policy.

This volume contains revised versions of the papers presented in the group’s meeting in Washington, DC, in April 2014. Ed Egan, the Innovation and the Economy Postdoctoral Fellow, provided extraordinary research assistance in this year’s conference and this volume. As
in years past, we thank the Kauffman Foundation for generous support of the NBER IPE platform.

For the first time, the papers in this year’s meeting were devoted to a single theme: high-skilled immigration to the United States. This focus was due to several factors:

- the central and growing importance of immigrants to US innovation, which makes immigration policies effectively a key policy for US innovation;
- the extensive policy discussions and legislative proposals for immigration reform that are currently underway, which often have implications for high-skilled immigration (e.g., raising the H-1B visa cap); and
- the complex and multilevel process of high-skilled immigration to the United States, which draws from many research communities and spans in scope from undergraduate admissions to firm-sponsored work visas.

In addition, the NBER is running from 2013 to 2016 a High-Skill Immigration Study Group, which is generously supported by a grant from the Alfred P. Sloan Foundation. This study group, led by William Kerr and Sarah Turner, has three central goals: (1) fostering a “critical mass” of researchers working on high-skilled immigration topics drawn from many fields within economics; (2) developing “collective goods” that will strengthen and improve research in this field, where data access has been a major hurdle for researchers; and (3) convening researchers and policymakers to discuss research on these topics in focused and dedicated sessions. The ability to hold a dedicated IPE session on this topic is strongly connected to this NBER working group’s themes and mandates.

While research on high-skilled immigration dates back several decades, study of the topic and its relationship to innovation began in earnest perhaps a decade ago. This launch was due to the growing importance of this topic for the United States and the breakthroughs by scholars in data development to study the questions. Before describing the contributions of this IPE volume, we provide a brief review of some key facets of the recent literature. This discussion pulls from William Kerr, “US High-Skilled Immigration, Innovation, and Entrepreneurship: Empirical Approaches and Evidence,” NBER Working Paper no. 19377, which provides greater detail and references for the work discussed.
Two data elements regarding high-skilled immigration are now well established: (1) that immigrants represent a substantial and disproportionate share of US science and engineering workers, and (2) that this share has been growing in recent decades. Immigrants represent about a quarter of the US innovative workforce, and about two-thirds of the net growth in this workforce since 1995. These immigrant contributions and their increasing trends are reflected in both innovation inputs (e.g., worker counts, firm starts) and the outputs of innovation processes (e.g., patent filings, scientific publications).

Beyond quantity, we are also converging on a portrait of the quality levels of immigrants compared to natives—in short, the degree to which immigrants for science and engineering are the world’s “best and brightest.” Recent research shows that immigrants involved in innovative work are mostly of comparable quality to natives engaged in innovative work; the overall advantage of immigrants for innovative work demonstrated in the before-mentioned quantities comes through choices that immigrants make around fields of study and higher educational attainment. In contrast to this general comparability, a second line of work shows that the outer tail of innovation talent for the United States contains disproportionately large shares of immigrants (e.g., authors of very highly cited papers, Nobel Prize winners). It remains unknown whether the most important impacts for the United States come through the quantities side (their substantial share of the overall innovative workforce) or their disproportionate contribution among extreme outliers in innovative activity.

Beyond the establishment of these key facts, the largest volume of work has examined the impact of high-skilled immigration on employment and wages of natives in science and engineering fields. These impacts are often termed crowding-in or crowding-out effects, depending upon whether native employment increases or declines as a consequence of the immigration. Absent exceptional quality differences for immigrants—which appear bounded by the above descriptive elements—the increase or decrease of innovation due to immigration depends in large part on how immigrants affect the employment of natives. A series of papers have examined whether causal connections exist between high-skilled immigration and innovation levels, with most researchers using differences across cities/states or technological fields to study the question. On the whole, the majority of these papers conclude a positive and causal connection exists—for example, greater high-skilled immigration into a city increases the patenting of a city—
but this view is not universally held and one example is contained in this volume.

More recent research has moved from these debates to considering other consequences of high-skilled immigration. Studied topics include the study of impacts for natives outside of science and engineering fields (e.g., management professions), the role of universities and graduate schools in the high-skilled immigration process, the study of how high-skilled immigration influences the regional allocation of inventive activity in the United States, the study of how high-skilled immigrants influence the global operations of their employer firms (e.g., foreign direct investment, trade), the extent to which high-skilled migration to the United States aids or hurts the home countries of the migrants, and much beyond.

With this in mind, the participants in this year’s IPE conference were selected to reflect the range of academic work being currently undertaken on the topic, including many different perspectives and a diversity of research techniques. All participants have done high-quality work in this field and, in many cases, discussed the work of others that helped shape their thinking. Reflective of the NBER’s requirement that researchers not make policy recommendations, participants focused on providing important findings from their line of research that are relevant for policymakers, and in their papers and presentations did not make explicit statements as to what policymakers should do. The NBER believes that other factors beyond economic analysis must be considered in making these choices, and the purpose of this volume is to provide quick and consolidated access to some of the latest economic approaches and findings.

The first paper in this year’s volume is by George J. Borjas and Kirk B. Doran. In a long-term research effort, the authors have closely studied the impact of a very specific migration wave—the immigration to the United States of Russian mathematicians beginning around 1990 as the Soviet Union collapsed. The authors have collected extremely detailed information about the publications of American and Soviet mathematicians before and after this migration. Russian and American mathematicians had often specialized in different fields prior to the Soviet collapse, and these differences across fields give the authors an avenue to examine American mathematicians more exposed to the Soviet influx compared to those less so. Among the authors’ findings are declines in the research productivity of exposed American mathematicians and shifts by some Americans toward less competitive areas of mathemat-
ics. The authors discuss these findings in the context of competition for resources (e.g., journal publications, university positions) that may not be easily expanded with the growing population of researchers. They conclude that this historical episode was not linked to a scenario where knowledge creation is automatically bolstered by greater numbers of skilled workers in a domain.

The second chapter is by John Bound, Murat Demirci, Gaurav Khanna, and Sarah Turner. This paper turns attention to the role of undergraduate universities in the immigrant admission process. This chapter reviews past research by these authors and provides some new empirical work prepared for the conference itself. The authors begin by noting the dual rise in the importance of information technology (IT) occupations in the United States and the rising share of immigrant workers in these IT occupations. The authors describe how degree receipt from US colleges and universities is an important pathway to participation in the US labor market in IT fields, with immigrant workers with US degree credentials particularly likely to persist in the United States. Higher US wages compared to those available in the home countries for many immigrants provide a strong incentive to finding employment in the United States even as temporary work visa policies (e.g., H-1B program) may limit entry. The authors discuss how periods of constrained temporary work visas supply, which are particularly binding for those educated abroad, can increase the attractiveness of degree attainment from US colleges and universities as a pathway to explore opportunities in the US labor market in IT and other occupations. The sharper understanding of these interconnections will be useful for policy design and understanding how responses on different migration margins are connected.

The third paper in the volume is by Paula Stephan, Giuseppe Scel- lato, and Chiara Franzoni. These authors shine the research light farther down the track to consider postdoctoral positions in science departments, where the United States is extremely reliant on immigrant researchers. Similar to chapter 2, these authors report new results in addition to reviews of their past work. In particular, the authors have conducted a massive survey of research-active scientists working in 16 countries. An element of this survey identifies factors that lead students and postdoctoral scholars who train outside their native country to come to the United States rather than go to a third country for study. The findings suggest that public policy plays an important role in attracting immigrants to study in a particular country. The United
States is a magnet for foreign students and postdocs because the United States has created a strong educational and research environment, and maintenance of this advantage is projected by the authors to be a key determinant going forward for US attractiveness. On the other hand, the United States scores lower on quality-of-life considerations, and the difficulty in accessing immigrant visas is frequently noted. Improvements on these dimensions would diminish the perceived downsides of postdoctoral work here.

The fourth paper continues this sequence by considering the role of US firms in high-skilled immigration. This chapter is prepared by Sari Pekkala Kerr, William R. Kerr, and William F. Lincoln. The starting point for this chapter is to note the substantial role of firms (similar to universities just discussed) in shaping high-skilled immigrant inflows into the United States. The authors review legal and economic reasons for why firms, and especially large and high-tech firms, are important for high-skilled immigration programs like the H-1B visa. The authors then discuss how recognition of the central role of firms in the process can provide a clearer foundation for analyzing the economic impacts of high-skilled worker inflows. Among the existing empirical evidence reviewed by the chapter is the positive connection of employment growth in immigrant-dependent firms to visa access, the uneven nature of this growth across worker age profiles within firms, the rising innovation rates in dependent firms with visa expansion, and the lobbying by firms for visa conditions. The authors close their chapter by depicting many important gaps in our understanding of this process and the required data to fill those gaps.

The last paper is by Richard B. Freeman and considers the increasing globalization of science and engineering and how that internationalization impacts the calculations that policymakers should make. The author begins by describing the strong growth in the global scientific and technological knowledge production that has characterized the post-war period. Growth and development abroad have reduced the United States’ share of world scientific activity, increased the immigrant proportion of scientists and engineers in US universities and firms, and fostered cross-border collaborations for US scientists. Over the last couple of decades, China has played a particularly sharp role in this process following its massive investments in university education and research and development (R&D). The author argues that the rising role of science and technology in industry and society result in science policy having central and renewed prominence, akin to and perhaps replacing
past industrial policies. Among the examples given of potential direct actions, the author discusses how requiring firms with R&D tax credits or other government R&D funding develop “impact plans” to use their new knowledge to produce innovative products or processes in the United States that could help the country adjust to the changing global economy and its pressures.

Together, these essays continue to highlight the importance of economic theory and empirical analysis in innovation policy analysis. While the issues involved are undoubtedly difficult, the chapters in this year’s volume continue to suggest that contemporary research in economics informs the evaluation of current and prospective innovation policy alternatives. The complexity and multilevel nature of high-skilled immigration result in a wide range of policies being relevant for the link of immigration and innovation, and this chapter provides a roadmap of the research currently underway in this important domain.

Endnote

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