Multinational Companies and the Demand for Foreign High-Skill Labor

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Abstract

This project aims to investigate how restrictions on skilled labor flows between countries shape total production, productivity and location decisions of multinational enterprises (MNEs) in the IT sector. I will build a multi-country model of multinational production with heterogeneous firms in which MNE affiliates located in different countries from the parent company are required to import labor from their source country in order to operate. Such a feature implies that migration is needed for MNEs to expand across destination countries. In the labor market, workers have heterogeneous preferences regarding what country they want to migrate to and work in based on their country-specific preferences, migration costs and wages. Once I have calibrated the model, I will focus on the reduction of a particular migration cost, the H-1B visa cap, and explore how increases in the visa cap would affect multinational activity in the United States and abroad.

Multinational enterprises (MNEs) are key players in the IT sector worldwide. As shown in Figure 1, Foreign Direct Investment (FDI) inflows from the US IT sector as a share of the US IT sector GDP have been consistently increasing since 2003, which can mostly be explained by an increase in foreign multinationals setting up affiliates in the US. There also seems to be a large, significant correlation between MNE activity and the demand for high-skilled immigrants. By looking at the 2012 H-1B visa applications in the US, it is shown in Table 1 that the top 20 companies with the most applications for H-1B visas are either headquartered in the US with affiliates abroad or are headquartered outside the US. Considering that foreign MNEs operating in the US also have access to L-1 visas that enable them to hire foreign workers who were employed by the firm outside the US, the high demand for H-1B visas suggests that importing labor might be crucial to establishing affiliates in countries other than where the parent company is located. Given the patterns of migration and MNE activity observed in the data, a relevant policy question that surfaces is how the location of economic activity in the IT sector would change if the US were to lift all restrictions on high-skilled labor immigration.

While the model I propose is a multi-country model, I will explain the reasoning behind my hypothesis by focusing on India and the US, where most of the action in MNE production and high-skilled labor demand in the IT sector takes place. If we think of the IT sector as producing different varieties, we can imagine that the US might have better technology to produce most of the varieties given larger efforts in R&D and a more highly skilled labor force. The US also has a larger

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consumer base for IT products since they have a comparative advantage in high-tech industries that demand more IT products and services. India, on the other hand, has the advantage of lower labor costs that allow them to produce IT more cost effectively. Differences in productivity and cost between the two countries allow them to trade varieties of the IT product. If we focus on production in Indian firms, they have two options: produce a good domestically and export the good to the US by paying a trade cost or open an affiliate in the US and produce the good there, paying an off-shoring cost. Given the technology differences between the two countries, the off-shoring cost represents the loss incurred when matching India's foreign production technology with the factors of production in the US. It is reasonable to assume that these costs can be mitigated by transferring factors of production between India and the US. A parent company in India that wants to set up an affiliate in the US can either hire Indian workers and send them to work in the US or hire American workers and bring them to work in India. Given that the compensating differential for sending Indian workers to the US is likely to be lower than that for bringing American workers to India, it will be necessary for Indians to migrate to the US. If this hypothesis is correct and migration is indeed a necessary condition for off-shoring, then it is reasonable to assume that restrictions on skilled labor flows will determine the organization of production across the world. If migration restrictions are lower than trade costs we would expect to see more MNE activity, whereas if migration restrictions are higher than trade costs we would expect to see more trade. Restrictions on labor flows can be either cultural, such as language and communication barriers, or institutional, such as restrictions imposed by national governments that limit the number of foreign workers that can move to a given destination. A relevant example of an institutional restriction is the H-1B program, in which the cap limits the number of new visas that can be awarded to high-skilled immigrants every year. If the US were to double the H-1B visa cap, Indian firms would find it easier to open affiliates in the US and would be able to substitute trade with multinational production. This mechanism would lead to production being concentrated in the US as opposed to India. On the other hand, if the cap is extended, US companies might find it easier to hire foreign labor in the US and might be able to open affiliates in India, reallocating production outside of the country.

This paper will investigate the relative size of these competing effects and address how changes in migration restrictions for high-skilled workers affect location decisions of IT firms, production, and welfare by adding multinational companies to a quantitative model of immigration. In addition, it will contribute to the literature on technology diffusion by looking into how multinational companies are a mechanism through which ideas are propagated. As noted by Foley and Kerr (2013), when inventors of a given ethnicity are responsible for a larger share of innovation in a US-based firm, production associated with affiliates related to that ethnicity increases. This indicates that MNE activity might account for part of the technology diffusion generated by immigration.

To my knowledge, this study will be the first to quantify the effects of changes in immigration restrictions on global migration patterns and MNE activity. In previous work, di Giovanni et al. (2015) built a general equilibrium model of immigration using heterogeneous firms and labor, but did not account for multinational production, which is how global production is predominantly organized. On the other hand, a number of papers including the seminal work of Helpman et al. (2004) and Ramondo and Rodriguez-Clare (2013) have proposed models of MNE production but do not allow for migration and cannot say anything about the effects of restrictions on international labor flows on MNE activity. In my own research, I have previously focused on how immigration policy in the US shapes human capital accumulation and welfare in the US and India (Khanna and Morales, 2016). Our paper focused on the labor market dynamics generated by the H-1B

program, including brain-drain and endogenous human capital acquisition as predominant mechanisms. While we did allow for trade between both countries, we did not consider the possibility of MNE production as a substitute for trade, and took migration decisions as a given. In the current paper, I propose combining the literature on MNE production with the literature on high-skilled immigration to explain how restrictions on skilled labor mobility might significantly affect the observed organization of production in a high productivity sector such as the IT sector.

To test how global production and MNE activity change when high-skilled immigration restrictions are relaxed, I plan to set up a quantitative multi-country model based on Helpman et al. (2004), where firms in the IT sector have heterogeneous productivities as in Melitz (2003) and produce an intermediate input used in the production of a final good. The key feature in this model is that there are competing strategies for firms to serve a foreign market such as through the domestic production and subsequent trading of goods and services, or through multinational production that takes place in the destination country. The firm is required to pay a different fixed cost for exporting versus producing abroad. I will incorporate a mechanism similar to that put forth by Keller and Yeaple (2013) or Ramondo and Rodriguez-Clare (2013) who propose that a firm needs to import a bundle of products from the source country in order to produce in another destination. In my case, the parent company will need to export labor to the destination country and pay the migration costs associated with the moving of workers. Firms will select their location and overall production strategies subject to the availability of domestic and foreign labor in the country where production takes place. The labor market in each country will be composed of individuals with heterogeneous preferences regarding working in each country. At the beginning of the period each worker will decide where to work based on their preferences, the wages paid in each country and the migration costs. In the context of a calibrated model, I will estimate whether increasing the H-1B cap will create a net inflow or outflow of economic activity in the US. Other interesting counterfactuals beyond the H-1B program are how MNE activity and migration will be affected when overall migration costs are eliminated. The model will be calibrated using a combination of aggregate datasets such as the BEA, OECD, Eurostat, and UNCTAD, micro-level datasets such as Orbis for firm-level characteristics and financials as well as H-1B visa applications from the United States Citizenship and Immigration Services. The key parameters to be estimated for each country are the elasticities of multinational production with respect to off-shoring costs and the elasticities of off-shoring costs with respect to migration costs. The first set of parameters will be estimated as in Ramondo and Rodriguez-Clare (2013) who use variation in bilateral trade and multinational production with respect to domestic consumption. The parameters related to the migration costs will be estimated using variation in bilateral high-skilled migration flows, changes in H-1B visas awarded to a company and changes in firm level employment.

This paper is innovative in many ways. For one, it will be the first to provide evidence on the link between MNE activity and high-skill immigration, addressing the question of how overall migration costs shape multinational activity across the world. Given the relevance of MNE production to aggregate welfare, understanding the determinants of FDI is crucial when thinking about economic policy. Second, this paper will serve to inform the debate on what is the optimal number of H-1B visas ought to be issued annually, particularly since effects on MNE activity are an unintended consequence of immigration policy that has not yet been explored in the literature. Finally, given that the IT sector is considered a big driver of innovation and growth, understanding the relationship between technology diffusion across countries, MNE activity and high-skilled immigration, will also shed light on the benefits and costs of high-skilled immigration.

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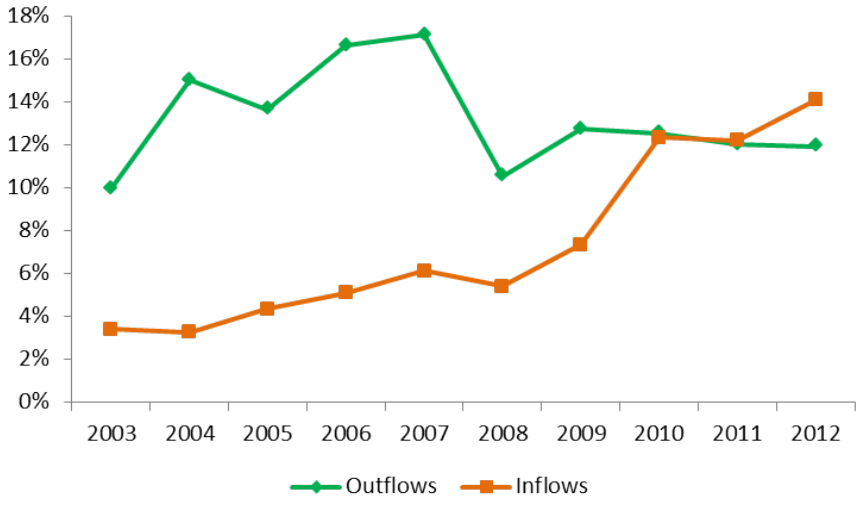
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1 Tables

Figure 1: Inflows and Outflows of Foreign Direct Investment in the US IT sector as a share of US IT GDP.



Foreign Direct Investment (FDI) Inflows and Outflows taken from OECD, IT Gross output taken from BEA. Inflows are investments from foreign countries into the US while outflows are investments from the US into other countries.

Table 1: Top 20 Firms that Submit Labor Condition Applications - Fiscal Year 2012

Firm name	Number of LCAs submitted	Share of Total LCA's	Parent Country
Infosys Limited	15818	3.81%	India
Wipro Limited	7182	1.73%	India
Tata Consultancy Services	6736	1.62%	India
Deloitte Consulting	4727	1.14%	UK
IBM India Private Limited	4075	0.98%	US
Microsoft Corporation	4067	0.98%	US
Accenture LLP	2619	0.63%	Ireland
Larsen & Toubro Infotech	2339	0.56%	India
Ernst & Young US LLP	2314	0.56%	US
HCL America Inc	2209	0.53%	US
Patni Americas Inc	2072	0.50%	India
Cognizant Technology Solutions	1853	0.45%	US
IBM Corporation	1837	0.44%	US
Deloitte & Touche LLP	1829	0.44%	UK
Google Inc	1695	0.41%	US
Qualcomm Inc	1679	0.40%	US
Intel Corporation	1669	0.40%	US
Oracle America Inc	1632	0.39%	US
Satyam Computer Services Limited	1563	0.38%	India
UST Global Inc	1368	0.33%	Philippines

Labor Condition Applications (LCAs) are the applications submitted by firms for H-1B, H-1B1 and E-3 visas. Data on parent country taken from Orbis. LCA data from US Department of labor.

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EDUCATION

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RESEARCH FIELDS

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WORKING PAPERS

"Understanding the Economic Impact of the H-1B Program on the US", with John Bound and Gaurav Khanna. December 2015. *Forthcoming in the NBER Global Talent SI Conference Volume*

WORK IN PROGRESS

"Uncovering the Role of Employers on the Effects of Immigration"

"The IT Boom and Other Unintended Consequences of Chasing the American Dream", with Gaurav Khanna.

"Multinationals Companies and the Demand for Foreign High-Skill Labor"

"Rents, Tenure and Earnings Losses for Displaced Workers: Evidence from German Establishments", with Pawel Krolikowski.

OTHER WORK

"Workforce Trends Related to Computing", with John Bound. August 2016. *Report prepared for the National Academies of Sciences, Engineering, and Medicine as part of the project on "Growth of Computer Science Undergraduate Enrollments"*

RESEARCH AND WORK EXPERIENCE

Academic
University of Michigan

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- Research Assistant for Professor Dimitry Stolyarov — Summer 2016
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Non Academic
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TEACHING EXPERIENCE

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- ECON 251: Introductory Metrics and Statistics (Undergraduate level) — Winter 2016
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AWARDS, FELLOWSHIPS AND GRANTS

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"Understanding the Economic Impact of the H-1B Program on the US": Labor Lunch Seminar, University of Michigan (May 2015); Macro and International Lunch Seminar, University of Michigan (October 2015); NBER Global Talent SI Conference, NBER (July 2016).

"The IT Boom and Other Unintended Consequences of Chasing the American Dream": Macro and International Lunch Seminar, University of Michigan (September 2016); Midwest International Trade Conference, Purdue University (December 2016)

OTHER INFORMATION

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Colleagues:

I am writing to enthusiastically support **Nicolas Morale**'s application for one of the Sloan Foundation Pre-Doctoral Fellowships focusing on the Economics of High-Skill Immigration

To my mind Nicolas is one of more promising students I have worked with in my 30 years at the University of Michigan. Over this time, I have had the pleasure to work with some truly remarkable individuals, including Jesse Gregory who is flourishing at the University of Wisconsin and Nicolas's coauthor, Guarav Khanna, who will be starting at U.C. San Diego next year. I believe Nicolas has a much promise as did Jesse or Gaurav at comparable stages in their careers. Like these individuals, he has both technical skills and economic insight.

I first really became acquainted with Nicolas as an intellectual force when he took my graduate course in labor economics a few years ago. He was an outstanding student in the course, participating very actively in class and writing the best term paper that year by far. Given my sense of his skills and interests in labor, trade and IO, I then recruited him to work on a Sloan funded projected on high skilled immigration with me and Gaurav. As I detail more bellow, he has continued working on related topics. The project he is proposing for the fellowship represents an outgrowth of work he has done with me and Guarav and so I will start by talking about this joint work before talking a bit about the proposed project.

In a project we have just finished, Nicolas, Guarav and I try to model the impact that high skilled immigration has had on the U.S. Economy. Empirical work by economists on the subject has often involved cross area comparisons to estimate the impact of high skilled immigration on the U.S. Economy. As an alternative to this approach, Nicolas, Gaurav and I use a simple, calibrated economic model to argue that, while it is very likely that high skilled immigration into the U.S. has benefited consumers in terms of lower prices and better products, most workers in terms of higher real wages, and the owners of tech companies in terms of higher profits, it is likely that it has dampened job prospects for U.S. natives interested in tech jobs. While the general idea for this project was mine, the work would not have been possible without Nicolas and Gaurav's multiple intellectual contributions. Indeed, given the respect I have for the two of them, the approach I took was to suggest a few ideas to Nicolas and Gaurav and then let them run with them. This paper is certainly as much Nicolas and Gaurav's as it is mine. If we followed conventions in the sciences, I would be last author.

In related research Nicolas and Gaurav (supported by a Sloan Foundation Pre-Doctoral Fellowship award to Gaurav) are examining the effect of U.S. immigration policy on the development of the IT sector in India. Economic reforms India adopted in the early 1990s are largely credited with the dramatic growth of the Indian economy since then. During this period of time, the IT sector of India's economy grew more rapidly than the rest of the economy. Much has been written about how U.S. trained entrepreneurs helped jump- start this part of the Indian economy. However, part of what made this growth possible was the existence of a well-trained but cheap (by U.S. standards) workforce in India. In this research, Nicolas and Gaurav are focusing on the potential role that U.S. immigration policy played in the growth in this workforce through two mechanisms. First, the possibility of migrating to the U.S. significantly increased the economic returns to an engineering degree in India. Second, high skilled immigrants to the U.S. often returned to India, taking back with them the skills they have learned here.

Prominent economists have argued that continued prosperity in the U.S. depends on our capacity to continue to be at the forefront technologically. Richard Freeman and others have argued that one way for the U.S. to continue to be at the forefront is to encourage the immigration of global talent. Others have argued that U.S. immigration policy is effectively helping to spur our competition, thereby eroding the U.S.'s economic position in the world. Nicolas and Gaurav's model nicely captures both of these factors. While the paper requires more work, Nicolas and Gaurav's preliminary results suggests that on net, high skilled immigration has contributed importantly to the growth of *both* the U.S. and Indian economies, with the gains accruing disproportionately to India. While there has been considerable discussion of the role the that skilled immigrants from India have played in the U.S. IT sector and the role the U.S. IT industry has played in the development of the IT sector in India, to the best of my knowledge "The IT Boom and Other Unintended Consequences of Chasing the American Dream" represents the first attempt to model the interplay of production and immigration.

I see the fellowship project Nicolas is proposing as an outgrowth of his work with Guarav. In "Multinational Companies and the Demand for Foreign High-Skill Labor," he wants to try to understand how restrictions on high skilled immigration affect that distribution of economic activity in the IT sector using a credible calibrated general equilibrium model of the world economy. Nicolas's proposed work reminds me of the work that has been done in trade theory on whether trade and immigration are substitutes on complements. However, while the work I know along these lines has been theoretical, Nicolas intends to build a credible calibrated model to answer this question.

Much of the recent work on immigration, including high skilled immigration, has used natural experiments to try to shed light on the impact of immigration on sending and receiving economies. I find this work fascinating and think we have learned a great deal from it. However, I believe that if we are to understand the impact that U.S. and other countries policies on high-skilled immigration has had on workers, consumers, and employers in the U.S. and in other countries we need to implicitly or explicitly evaluate counterfactuals. Doing so will require the building and calibration of credible general equilibrium economic models.

Nicolas is moving in precisely this direction. I believe the coauthored work he has done to date is interesting. The work he is proposing is that more ambitious. I believe Nicolas has the skills to pull this off. In addition, at Michigan, he has faculty in both labor and trade to help guide him.

All in all, I believe Nicolas should be an outstanding candidate for a dissertation fellowship.

Should you have any questions about either Nicolas or his work, please feel free to contact me.

Sincerely,



John Bound
George E. Johnson
Collegiate Professor of Economics