Research Proposal
for NBER Pre-Doctoral Fellowship Program:
Location Choice of Highly Educated Immigrants and Spillovers in Cities

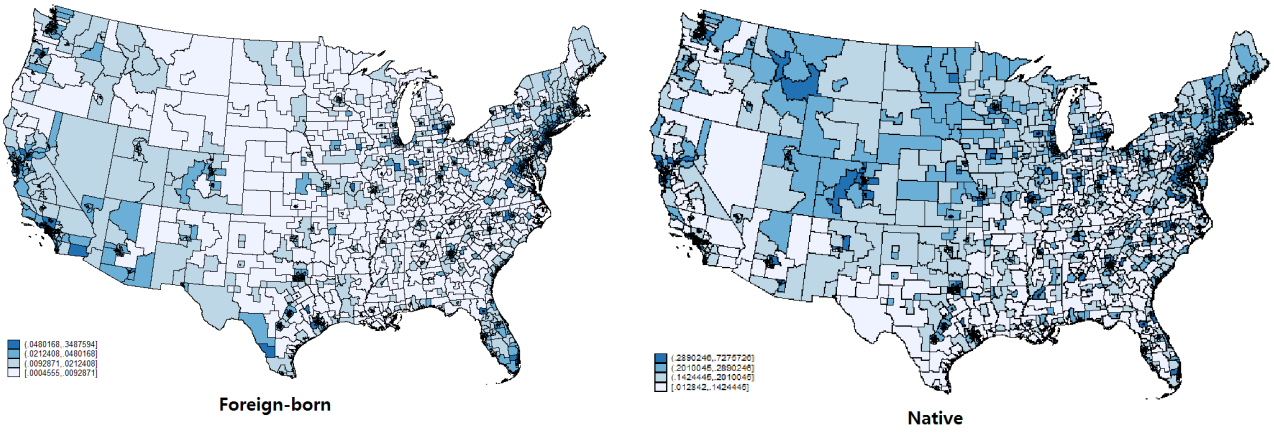
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1 Introduction

The foreign-born share of highly educated employees in the United States has significantly risen in recent decades, but the geographic distribution of their residence is unequal. Figure 1 clearly describes this pattern. College-educated foreign-born people are very concentrated in a few cities such as San Jose or New York, but college-educated natives are relatively evenly distributed across geographic areas. Despite this significant difference, economic analysis has paid little attention to the question of why highly educated foreign-born workers locate in different places.

Figure 1: Geographic distribution of college graduates in 2000



Note: Author's calculations from IPUMS (Ruggles et al. 2010) version of the Decennial Census 2000 5% sample. The numbers represent share of college graduates out of total population in cities. The units of observations are PUMAs. People with a Bachelor's degree or higher are counted as college graduates.

In this paper, I compare location choices of foreign-born college graduates to those of native college graduates during the period 1960-2000. Specifically, I relate change in *foreign-born* population with bachelor's degrees or higher in cities to three possible factors: (1) local demand shock, (2) change in share of *native* college graduates, and (3) imputed share of highly educated immigrants from 1960.

The predictions of first two factors are ambiguous[1]. First, although Cadena and Kovak (2013) have documented that *low-skilled* immigrants respond very strongly to changes in local labor demand, the effect on *high-skilled* immigrants are not consistent across their specifications[2]. Second, the impact of increased share of native college graduates on change in college-educated foreign-born people could be either positive or negative in theory. Immigrants may systematically prefer cities with lower share of native workers to

[1]The prediction from the last factor is well documented in the literature. The "imputed" inflow of immigrants has been widely used as an instrument to estimate the impact of immigrants on various outcome of natives. (Card 2001, Card 2009, Iranzo and Peri 2009, Lewis 2011, Smith 2012, and Peri et al. 2015). The validity of the instrument is that the variation comes from conditions in sending country, not by demand conditions in the destination areas.

[2]High-skilled immigrants in Cadena and Kovak (2013) are defined as foreign-born with some college or higher education.

avoid competition effect (Cadena 2013). On the other hand, imperfect substitution between native and foreign-born workers (Peri and Sparber 2011) may attract high-skilled immigrants into cities with higher share of college-educated natives.

Here, I carefully investigate how college-educated immigrants have responded to these exogenous changes in local labor demand and share of college-educated natives for a relatively long time period 1960-2000[3]. Since the share of college-educated natives might be correlated with other unobservable factors in cities that directly affecting the geographic locations of high-skilled immigrants, I construct an instrumental variable using pre-Vietnam war (1960) demographic distribution in cities, interacted with specific trend in share of non-veteran college graduates by year of birth.

After I document how foreign-born college graduates respond differently to native college-graduates, I separately estimate spillovers from the foreign-born and native college graduates to workers who reside in cities, by comparing wages for similar individuals who work in cities with different shares of foreign-born and native college graduates. To deal with the presence of unobservable characteristics of individuals and cities, I use two instrumental variables: pre-Vietnam war (1960) demographic distribution in cities for higher education of natives and the imputed number of highly educated immigrants inferred from the prior presence of immigrant communities by the 1960 census.

A large literature has documented a increased geographic sorting of college graduates in expensive cities and externalities from higher education[4], but little is known whether the magnitude of spillovers varies within the high-skilled market between natives and immigrants. The spillover effects from high-skilled immigrants are likely different to those of natives, due to the different specialization (STEM fileds) and skill-level within college graduates (more doctorate or professional degrees).

2 Data and Empirical Specification

Data

I use the samples of the U.S. Censuses from the 1960, 1970, 1980, 1990, and 2000 Integrated Public Use Microdata Series (IPUMS) (Ruggles et al. 2010). These data are used to construct city-level estimates of variables including local labor demand and supply shocks. The units of analysis for local labor markets are Commuting Zones (Tolbert and Sizer 1996).

Location Choice of Highly Educated Foreign-born

My empirical strategy examines change in a city's number of college-educated *immigrants* as a function of the local demand shocks driven by the industry mix in each city, the imputed local share of native

[3]During this period, foreign-born population has surged from 9.7 millions to 31.1 millions. (Source: U.S. Census Bureau, Census of Population, 1850 to 2000)

[4]See Rauch (1993), Acemoglu and Angrist (2001), Moretti (2004a), Moretti (2004b), Iranzo and Peri (2009), and Diamond (2013).

college graduates, and the imputed share of foreign-born college graduates. In order to compare with highly educated natives, I run the same regression with change in number of *native* college-educated being the dependent variable. My sample includes individuals age 23-55, not currently enrolled in school, and not living in group quarters. My reduced-form specification is

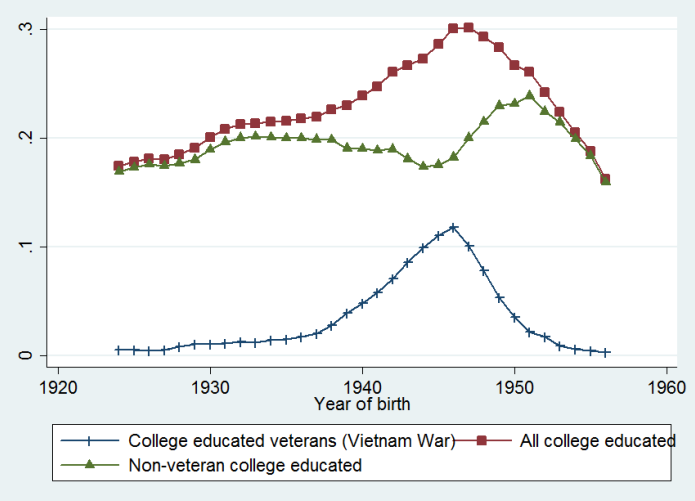
$$\Delta H_c^{Native} = \alpha + \beta_1 Bartik_c + \beta_2 \widehat{N_c} + \beta_3 \widehat{F_c} + \Pi \Delta X_c + \Delta \varepsilon_c \tag{1}$$

$$\Delta H_c^{Immigrant} = \gamma + \delta_1 Bartik_c + \delta_2 \widehat{N_c} + \delta_3 \widehat{F_c} + \Theta \Delta X_c + \Delta u_c \tag{2}$$

ΔH_c^j is log change in the number of college graduates in city c for group j between 1960 and 2000. $Bartik_c$ is the standard measure of local demand shock during the period (Bartik (1991)). $\widehat{N_c}$ and $\widehat{F_c}$ are imputed share of college-educated native and foreign-born in city c respectively.[5] X_c is a vector of other city characteristics. The specification is specified as first difference equation so that any time-invariant city-specific fixed effects are swept away.

Imputed share of *native* college graduates, $\widehat{N_c}$, is constructed using the national level of share of non-Vietnam war veterans who graduated college by 1980. Figure 2 shows the trend in this take-up rates across year of birth. The fraction of non-veteran college graduates for birth cohort between 1933 and 1951 shows very different trend with other groups. While the fraction of all college graduates has increased for older cohorts (people born before 1946) and then decreased (people born after 1946), the share for non-veterans shows completely opposite pattern.

Figure 2: Fraction of college graduates by birth year cohort



Note: Author's calculations from IPUMS (Ruggles et al. 2010) version of the Decennial Census 1980 5% sample. People with a Bachelor's degree or higher are counted as college graduates.

[5]These variables are constructed to relieve the concerns from omitted variable bias. For example, cities that had a large increase in highly educated people may have better amenities so that further attract more college graduates. If this is the case, omitted variable bias will cause my estimates to be biased upward.

Therefore, I use this plausibly exogenous variation across different birth cohorts, interacted with pre-Vietnam war (1960) geographic distribution of the people who were born between 1924 and 1956 (age 23-55 in 1980). Specifically,

$$\widehat{N_c} = \frac{\sum_b S_b \cdot Pop1960_{bc}}{\sum_b Pop1960_{bc}} \tag{3}$$

where S_b is the national level of the share of non-Vietnam war veterans who have graduated college by 1980 for birth year b and $Pop1960_{bc}$ denotes the total number of men born in year b and live in city c in 1960. In order to prevent variation from highly educated veterans, I further control the imputed share of college-educated veterans.

For the construction of imputed share of *foreign-born* college graduates, $\widehat{F_c}$, I use different likelihood of being a college-educated for a nationality and the initial (1960) distribution of immigrants by *nationality*.

$$\widehat{F_c} = \frac{\sum_n Lag\text{-}Sh_n^c \cdot F_n}{Lag\text{-}Pop_c} \tag{4}$$

where $Lag\text{-}Sh_n^c = M_n^c / M_n$ is the share of immigrants, from nationality n in city c in 1960, and F_n is the aggregate share of college-graduates from nationality n in 1980. $Lag\text{-}Pop_c$ is the size of population in city c at year 1960 for normalization.

Decomposing Human Capital Externalities in Cities

Here I separately estimate the spillovers from college education of foreign-born and native workers. Spillovers from immigrants could be different to those of natives in many aspects. One channel is through the fact that highly educated immigrants are very concentrated in STEM fields. This different specialization of foreign-born workers could increase the productivity of workers in other industries. Also, even within the college graduates, foreign-born people are more likely to hold a doctorate or professional degree than the native born, which possibly generate productivity growth in local areas.

I first divide workers into 8 different groups by nativity (foreign-born and natives) and skill level (high school dropouts, high school graduates, some college, and college graduates or more) to evaluate different effects to different groups of workers. Then I regress the change in group-specific regression-adjusted wage[6] in a city on the *actual* shares of foreign-born and native college graduates.

$$\Delta\widehat{w_c} = \mu + \lambda_1 Bartik_c + \lambda_2 \Delta N_c + \lambda_3 \Delta F_c + \Phi X_c + \Delta e_c \tag{5}$$

The actual shares of foreign-born and native college graduates, ΔN_c and ΔF_c, are instrumented using the imputed shares ($\widehat{N_c}$ and $\widehat{F_c}$) from the previous section. This will control individual and city level unobservable factors that may affect workers' wages.

[6]Regression-adjusted wage is obtained by conditioning on individual education, gender, race, birth state, birth year, and work experience. I weight the regression by Census person weight.

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Education

- Ph.D. Candidate in Economics, University of California, Davis. expected in June 2017
  Dissertation Committee: Giovanni Peri (chair), Gregory Clark, and Marianne Page
- M.A. in Economics, University of California, Davis. September 2013
- Masters coursework in Economics completed, Korea University, March 2011 - June 2012
- Exchange Student Program, Binghamton University, August 2008 - June 2009
- Bachelor of Business Administration, Korea University, March 2004 - February 2011

Research Interests

- Primary: Labor Economics, Urban and Regional Economics
- Secondary: Economic History, Applied Econometrics

Work in Progress

"Impact of Local Human Capital Shocks"
"Location Choice of Highly Educated Immigrants and Spillovers in Cities"
'Intergenerational Mobility and Migration: Evidences from U.S. Commuting Zones"
(with *Jun Sung Kim, Monash University*)"

Research Experiences

- Research Assistant to Professor Kwanho Shin, Korea University, July 2011 - June 2012
- Research Assistant to Professor Shelley Dionne, Binghamton University, January 2009 - May 2009

Teaching Experiences

• Teaching Assistant (*Graduate*): Econometric Foundations (for first year Ph.D. students, Fall 2015), Cross-Section and Panel Econometrics (for second year Ph.D. students, Winter 2016)

• Teaching Assistant (*Undergraduate*): Principles of Microeconomics (Winter 2013, Spring 2014), Principles of Macroeconomics (Summer I 2014), Intermediate Microeconomics (Fall 2013), Intermediate Macroeconomics (Winter 2014), Economics of Labor Market (Fall 2014, Winter 2015, and Summer I 2015)

Fellowships, Grants, and Awards

- Non-Resident Graduate Fellowship, UC Davis, September 2013 - Fall 2015
- Brain Korea 21 Fellowship, March 2011 - June 2012

Presentations

Fall 2015: Applied Microeconomics Brown Bag Series, UC Davis

Winter 2015: Applied Microeconomics Brown Bag Series, UC Davis

Skills

- Languages: English (fluent), Korean (native)
- Programming: STATA, R, LaTeX, Excel

References

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From: Giovanni Peri
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December 12, 2015

Letter of Recommendation for Jongkwan (Kwan) Lee

Dear members of the NBER Fellowship Committee

I am happy to recommend Jongkwan Lee, a fourth year graduate student in the Ph. D. program of the Department of Economics at UC Davis, for the NBER Pre-Doctoral Fellowship Program on the Economics of High Skill Immigration. I am his main thesis advisor.

I have known Jongkwan for 2 years and I think he is a very good student and his research project has several interesting and innovative aspects. The topic he focuses on is the location of high skilled foreigners in the US and how important are labor demand changes, concentration of highly skilled natives and existing networks of immigrants to determine their location.

Research Question

The question tackled by Kwan's proposal is how labor demand and immigrants' preferences affect the location of high skilled (college educated) immigrants across US cities, in the long run (decades). While we have known for a while that highly educated individuals are highly mobile (Grogger and Hanson 2013) and that immigrants move more than natives in responses to local shocks (Cadena and Kovak, 2015), we do not have a complete account of what determines the location of highly educated immigrants.

We know that overall immigrant population is more concentrated in urban areas and in large cities relative to natives, but we have not analyzed the location of highly skilled immigrants in detail. We also know that for them the network (i.e. previous immigrants of the same country) are less important in determining location while labor demand is more important, but a more precise quantification is needed.

Kwan's project considers the change in high skilled immigrant share across US cities in the period 1960-2000 as depending on three factors.

1) The skill-intensity of labor demand in that location. Namely he measures the increase in employment/wages of college educated in each industry nationally and weights those by the industry composition of the commuting zones in 1970 or metropolitan areas.

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2) The presence of historical networks of immigrants from the same country. The study constructs proxies of immigrant networks using a shift-share instrument across nationalities.

3) The presence of high skilled natives. The presence of skilled natives can generate local amenities (good schools, good cultural goods) that are also valued by high skilled immigrants (as in Diamond 2015). Their change has to be instrumented with a variable affecting native college education but not, directly, immigrants'.

Jongkwan will analyze the impact of these three factors, quantify the relevance of each, and then he will move to the related question of whether highly educated immigrants have a positive externality on native wages at the local level.

Relevance

Immigration of highly educated workers has grown in the US and it has become the largest share of net immigration in the last 10 years. Highly educated foreigners contribute substantially to create new human capital agglomerations. Some cities in the US have thrived in innovation and technology thanks to them. The question asked by this study is very important as cities try to identify the right seeds to attract human capital and possibly to capture a larger share of the growing highly educated immigrant population.

The determinants of skilled immigrant location, if different from natives' location, imply that municipalities and regions may attract skilled immigrants and benefit from them leveraging measures and policies that may have a specifically strong effect on them. At the same time this study will help separating the factors that attract immigrants and are labor-demand driven, from those that are preference driven.

Methods and Data

The novelty of Jongkwan' s research is not much in the data used (that mainly consist of a combination of Census data for the period 1960-2000) but in the fact that he will try to identify variations of skilled immigrant concentration across cities driven by different factors that have been used as "instruments" in the previous literature. Moreover he introduces a new interesting instrument as determinant of the share of native college educated in a location, which could be a further element attracting skilled immigrants (co-location of highly skilled for amenities reasons).

Technology-driven local changes in skilled demand have been constructed as a measure of change in demand and used in several previous studies (often called Bartik instrument). Network-driven distribution of new immigrants has been the main instrument to proxy immigrant supply shift used since Altonji and Card (1991) in the immigration and labor market literature. Kwan studies

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systematically the effect of these two forces on skilled immigrant location. Then the presence of college educated natives is included as further determinant of location.

Here the instrument is a modification of what used in the literature on the impact of Vietnam draft on several outcomes. Jongkwan uses the probability of being drafted for the Vietnam War of each cohort of US born individuals and the distribution of cohorts across US metro areas to predict the increased probability of college due to veteran education in a location. This instrument provides variation in native college attendance and graduation rates that vary across cities depending on the age structure of eligible people. This only affects directly native education and hence can be used to identify the further attractive effect of skilled native on immigrants.

The different instruments (determinants) affecting location of college educated natives and immigrants, allow to estimate also the strength of the co-location (a self-reinforcing effect depending on the amenity externality) effect, namely how much native high skilled concentration acts as an attractor of foreign skilled.

Once this is estimated the analysis can be extended to estimate human capital externalities on wages of each group.

Overall Assessment

The paper project is very interesting and has innovative components, combining the literature on human capital concentration/externalities (developed by several papers by Enrico Moretti, Rebecca Diamond and others) with that on immigrants' location. Kwan is an excellent student with very good quantitative skills and he will certainly make very good progress on this project in the coming year. He has been working independently and entrepreneurially, and he will certainly be an excellent job market candidate next year. I recommend him strongly for the fellowship.

Regards
Giovanni Peri

