To Move or Not to Move? The Impact of Immigration Influx on Natives' Neighborhood Choices in Seoul, Korea

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Abstract

We investigate the impact of an increase in immigrant inflows on natives' residential choices in a large metropolitan city in Asia. In our empirical analysis, we utilize a novel administrative dataset which contains information on the universe of residential address changes and self-reported reasons for relocation. Exploiting the expansion of a special visa program that has significantly changed the composition of new immigrants as an exogenous shock, we find that immigration inflows are both a push and a pull factor for natives. While neighborhoods in Seoul lost more than five natives for every 10 additional immigrants between 2006 and 2015, native workers were drawn to places with immigrant inflows for job-related reasons.

Keywords: *Immigration, Native Flight, South Korea*

JEL: J15, J61, O15, R23

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1. Introduction

Immigration has a significant impact on host countries. The inflow of immigrant workers influences natives' labor market outcomes such as wages and employment (Borjas, 2003; Card, 2009; Ottaviano and Peri, 2012; Dustmann et al., 2016). In addition, the segregation of immigrant communities may negatively affect future labor market outcomes regarding immigrants' children or may cause a low degree of assimilation (Cutler et al., 2008; Chetty et al., 2014; Danzer and Yaman, 2013).

There is already a substantial body of literature regarding the question of whether an inflow of immigrants triggers increased segregation between immigrants and natives or the "flight" of the native population[1]. However, the question of which factors trigger the tendency of native flight remain largely unanswered.

Our study provides new evidence of native flight and the reasons for flight by using a unique administrative dataset from Seoul, South Korea. South Korea recorded an astonishing 372% increase in the number of immigrants from 2000 to 2017, the largest growth in Asia, excluding the Middle East (UN, 2017). The case of South Korean immigration is unique because a significant share of immigrants consists of overseas Koreans (i.e., ethnic Koreans that reside in other countries, such as Chinese Koreans).

For our study, we gather high-quality administrative datasets from various sources which are combined at the level of the smallest administrative unit within Seoul. This enables us to analyze the impact of the increased number of immigrants on natives' residential neighborhoods within the same local labor

[1] Saiz and Wachter (2011) found that a growing immigrant density in neighborhoods leads to native flight due to a relative decrease in housing value appreciation. Other studies have examined whether native families respond to immigration by sending their children to private schools (Betts and Fairlie, 2003; Cascio and Lewis, 2012).

market. Furthermore, we utilize a novel administrative dataset on the internal migrations of natives and their specific reasons for moving, gathered from official government records of residential address changes. This provides a rare opportunity to look into the reason for natives' response to the increased density of immigrants within their neighborhood.

Our identification strategy exploits the expansion of the visa programs for overseas Koreans from 2007. Particularly, the F-4 visa allows almost unrestricted economic activities and largely an unlimited length of stay for ethnic Koreans. Using the predetermined spatial distribution of each immigrant group in 2005 as weight, we computed the predicted increase of overseas Koreans—driven by the F-4 visa—into 418 neighborhoods in Seoul. This instrument strongly predicts the actual growth of immigrants during the study period. Furthermore, the composition of the country of origin from the F-4 visa is significantly different from the existing composition of immigrants in Korea, relieving the concern on the conflation of the short- and long-run responses to immigration.

We find that the growing immigrant communities during the period 2006-2015 led to a substantial increase in natives' out-migration. Our analysis reveals that neighborhoods in Seoul on average lost more than five natives for every ten immigrant arrivals. On the other hand, we also find that natives, especially young workers, simultaneously move into immigrant areas for job-related reasons.

A unique composition of immigrants in South Korea helps us to narrow down the plausible mechanisms for native flight. Since a large influx of overseas Koreans still generates native flight, we rule out ethnic and linguistic heterogeneity as dominant factors. This result indicates that a comparable case is "white flight" that was induced by the migration of African-Americans from rural areas to cities in the United States during the period between 1940 and 1970, which may not have been caused by race *per se,* but by other reasons (Boustan, 2007, 2010). Moreover, we show that natives may choose to move into or out of neighborhoods where there is a significant presence of immigrants depending on different motivations.

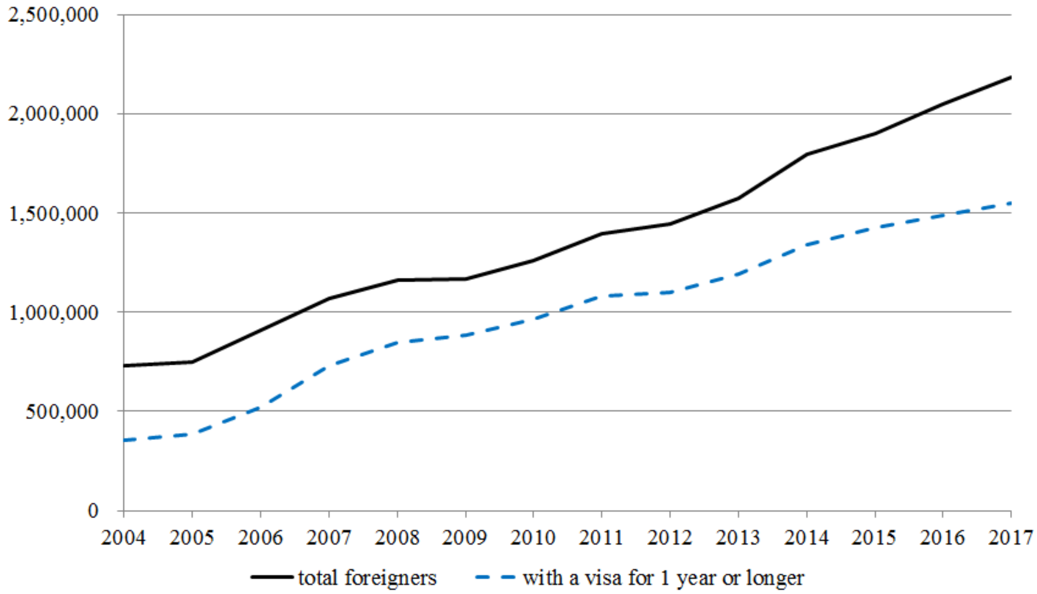
Our results contribute to the literature related to the effect of immigration by presenting various motivations in addition to the differential labor market opportunities. Although some previous studies analyzed the impact of immigration on outcomes such as crime and housing prices (Bell et al., 2013; Saiz, 2003, 2007), the existing body of literature mostly focuses on the labor market effects of immigration. Our study confirms that natives respond to immigration influx, not only by leaving their neighborhoods, but also by being drawn into places with a growing population of immigrants for employment opportunities.

The rest of our study is organized as follows: Section 2 describes the background of immigrants in South Korea, Section 3 describes the data, and Section 4 explains the empirical approach we applied for our study and provides the results. We review robustness checks in Section 5. In Section 7, we offer concluding remarks.

2. Background

South Korea has been experiencing a rapid increase in the inflow of immigrants. In 2007, more than one million foreigners were staying in Korea (Figure 1). From 2007 to 2017, the number has doubled, bringing the number of foreigners residing in Korea to more than two million (Ministry of Justice, 2017). During the same 10-year period, the native population of Korea increased by only 5.6% or about 0.55% annually. A significant number of the foreigners stay in Korea with visas for one year or longer. As of 2017, more than 1.5 million foreigners (70% of the total foreigners) in Korea have a visa for staying in Korea for one year or longer.

Figure 1: Immigration trends in Korea



A unique feature of immigration in South Korea is that a large portion of immigrants is overseas Koreans. Early in the 20th century, many Koreans emigrated to China, Russia, and other countries.[2] The majority of these Koreans and their descendants have been allowed to enter Korea with an F-4 visa, which is issued exclusively to overseas Koreans. Additionally, the H-2 visa (working visit visa) is granted to overseas Koreans living in China or the former Soviet Union area. Table 1 provides information regarding the two visa programs. In 2017, the number of F-4 visa holders staying in Korea was more than 400 thousand, and the number of immigrants in possession of an H-2 visa was approximately 240 thousand (Ministry of Justice, 2017).

[2] Many of these overseas Koreans are Korean-Chinese, and they account for the majority of immigrants in Korea.

Table 1: Visas granted to ethnic Koreans

Visa Name	Visa Code	Maximum Length of Residence	Right to Work	Number (2017)
Overseas Koreans	F-4	Semi-permanent*	Yes	415,121
Working Visit	H-2	4 years and 10 months	restricted to some manual work	238,880

Notes: F-4 visa can be renewed repeatedly only with little restriction, so is usually called "semi-permanent"

These two visa programs play crucial roles in allowing overseas Koreans to reside and work in South Korea. Recently, the Visit Employment System introduced in 2007 declared that all overseas Koreans living in China and the former Soviet Union area are entitled to a working visit visa with a maximum period of 4 years and 10 months. Consequently, the number of overseas Koreans immigrating to Korea increased from 20,000 in 2004 to almost 300,000 in 2008 (Yamanaka, 2010). The F-4 visa program has also been expanded, particularly to the overseas Koreans in China and the former Soviet Union. Before 2004, the issuance of the F-4 visa was possible only for the overseas Koreans who had emigrated after 1948. The discriminatory provision was repealed by the Constitutional Court of Korea in 2001, and a new set of rules has been applied since 2004. The full-scale increase of the F-4 visa began a few years later when a switch from the working visit to the F-4 visa status became possible.

Korean-Chinese immigrants account for the largest portion of overseas Koreans with foreign nationality residing in Korea. In 2015, 86% of overseas Korean immigrants were of Chinese origin (Ministry of Justice, 2016) and of the total of 20 million Korean-Chinese, almost 20% reside in Korea (Lee, 2010).

The demand for immigrant workers is primarily for low- or unskilled jobs in factories, in construction, and services (Park, 2017). In 2016, the most significant industries hiring migrant workers were manufacturing and mining

(46%), followed by wholesale, retail, accommodation, and the food service industry (19%), and producers, consumers, and the public service industry (19%) (Ministry of Justice, 2017). On the other hand, only 17% of the economically active native population in Korea is in manufacturing and mining (Statistics Korea, 2017).

Immigrants in Korea tend to have lower levels of education than native Koreans (Table 2). According to the Population and Housing Census of Korea for the city of Seoul in 2015, the number of immigrants with college degrees or higher was 32.5% for individuals 25 years or older, while 54.4% of native Koreans in Seoul for the same age group had college degrees. This gap increases if we exclude the older population and take only the population within the age group 25 to 64 (33.4% for foreigners versus 61.6% for natives).

Table 2: Skills levels of immigrants and natives in Seoul (2015)

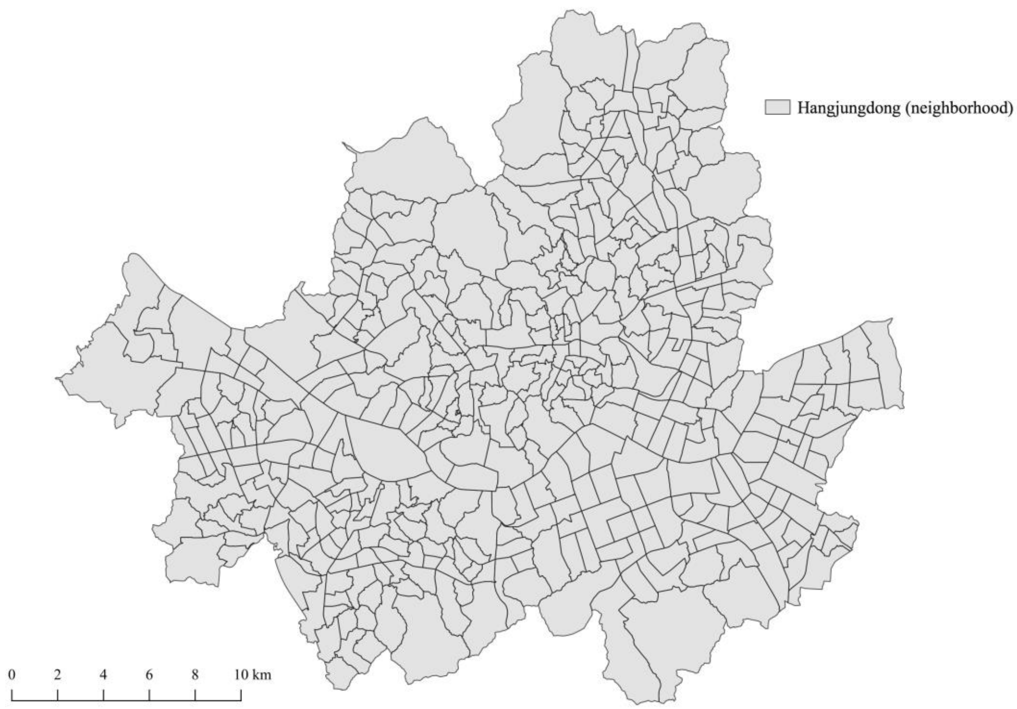
			Education Level			
	Age	Total	No Education	Primary	Secondary	Tertiary+
Immigrants	25+	260,906 (100%)	2,244 (0.9%)	19,783 (7.6%)	154,129 (59.1%)	84,750 (32.5%)
	25-64	244,920 (100%)	636 (0.3%)	15,038 (6.1%)	147,555 (60.2%)	81,691 (33.4%)
Natives	25+	7,169,289 (100%)	124,903 (1.7%)	514,883 (7.2%)	2,626,969 (36.6%)	3,902,534 (54.4%)
	25-64	5,968,868 (100%)	9,353 (0.2%)	174,884 (2.9%)	2,109,572 (35.3%)	3,675,059 (61.6%)

3. Data

Our main analysis focuses on Seoul, the capital and the largest city in Korea. This allows us to look into natives' neighborhood choice within a densely populated metropolitan area. In 2015, the total population of Seoul was 10,485,620, including 457,806 foreign-born populations.[4]

The regional unit of our analysis is *hangjungdong*, which is the smallest administrative unit within a city in Korea. Seoul (605.2 km^2) has 424 *hangjungdong*s, each of which is approximately 1.4 km^2 with 23,000 residents. These administrative units change over time; therefore, we define 418 neighborhood areas so that we keep the geographic units constant over time.[5]

Figure 2: Map of Seoul showing *hangjungdong* – 2015



[4] Foreign-born populations are composed of foreign residents (including migrant workers, marriage migrants, foreign students, overseas Koreans), naturalized residents, and children with immigrant background. This study does not consider short-term residents who stay less than 90 days.

[5] In total, there were 518 *hanjungdong*s in 2006 and 423 *hanjungdong*s in 2015. We redefine 418 neighborhood areas, which largely overlap with *hanjungdong*s in 2015 (Figure 2). We exclude three outliers where the growth rate of domestic residents between 2006 and 2015 exceeds 1,000%.

3.1 Data sources

We combine various available sources of administrative data at the small neighborhood level. The first set of administrative data is from the Statistics of Registered Population (2006-2015) and the Statistics on Foreign Residents by Local Governments (2006-2015). These administrative statistics are used to determine the numbers of residents by nationality in each neighborhood.

The second set of administrative data is based on move-in registration records. The move-in registration form is mandatory for all domestic residents who move into a new neighborhood. Therefore, the data set covers the universe of official moving records. The Statistics on Internal Migration (SIM) data—an individual-level dataset provided by the Statistics Korea—includes the application date, the neighborhoods the applicant (and their family) moves into and out of (coded at the *hangjungdong* level), the main reason for moving, and family background such as the age and gender for each family member. The application is required to be submitted within 14 days after moving.

It is noteworthy that a question regarding the main reason for moving exists.[7] This provides a rare look into the reasons behind the internal migration of domestic residents with a substantial sample size. Applicants choose from seven possible answers: job, education, family[8], residential environment[9], housing[10], natural environment, and other reasons.

The third set of administrative data is the Officially Assessed Reference (OAR) land price (2006), which is assessed and disclosed by the Ministry of Land,

[7] The official move-in registration form includes this survey question, and the applicant is obligated to answer this question truthfully in accordance with the Statistical Law.
[8] To live with family, for marriage, or to live away from family.
[9] Transportation, cultural facilities, or other local amenities.
[10] Home purchase, lease termination, rents, or redevelopment.

Infrastructure, and Transport.[11] While the OAR price is often lower than the actual sales price of property in the region, it is less susceptible to selection bias, more representative of the regional characteristics, and more stable.

Lastly, using the locations of Metro stations and schools in Seoul in 2006, we construct various control variables such as the number of Metro stations, the distance to the nearest international school, and the school district (see the map of school districts, Appendix A) of each regional unit. We also use data from the Census on Establishments in 2006 with information on the number of establishments and workers (according to industry) in each neighborhood to construct additional control variables.

3.2 Descriptive statistics

Table 3 shows a summary of the statistics from the sample. In 2015, the average population per neighborhood was approximately 23,000 with individual neighborhoods' population ranging from 1,000 to 86,000. Between 2006 and 2015, the immigrant inflow accounts for about 3% of the total population counted in 2006. However, some neighborhoods showed an increase of more than 10%, with the highest growth being 47%. During the same period, the native population increased by an average of 1%. The causal relationship between these two variables is of significant interest to this study.

Figure 3 shows the spatial variation of these two variables. Upon casual glance at the figure, the distribution of immigrants seems more concentrated relative to the total population. Also, we can identify regions exhibiting a decrease in natives where there were a substantial concentration of immigrants. However,

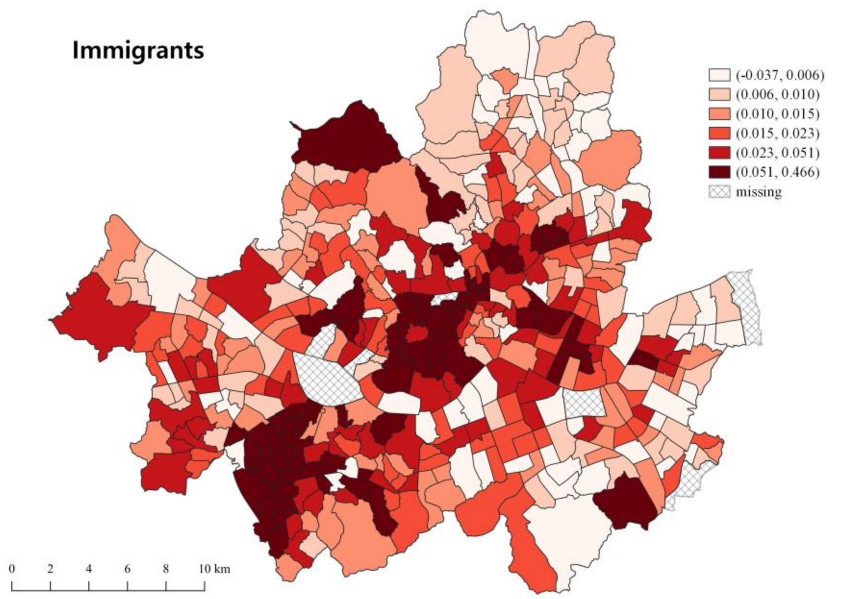
[11] A complication in our study arises since the OAR price information is provided at *beobjeongdong* level, a more traditional unit for neighborhoods. We processed this price information into *hangjungdong* level data by using officially-provided mapping of the *beobjeongdong* and *hangjungdong* codes.

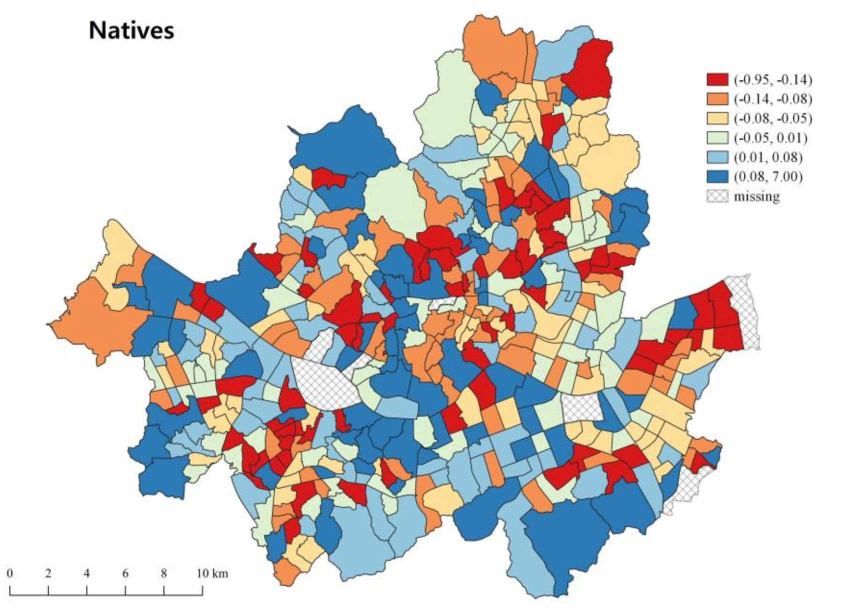
it is not immediately evident whether this negative correlation is causal. To obtain the causal estimates, we use the F-4 visa imputed increase of immigrants, which we will explain in detail in the next section. Other variables are used as control variables in our regressions.

Table 3: Descriptive Statistics

Variable	Obs	Mean	S.D.	Min	Max
Population (2006)	418	24,762	9,764	1,320	94,128
Population (2015)	418	24,742	9,858	1,003	86,609
Population Density (2006, per km^2)	418	25,631	12,844	548	60,207
Area (2006, km^2)	418	1.41	1.52	0.22	13.24
Growth Rate of Native Population	418	0.01	0.42	-0.95	6.70
Growth Rate of Immigrant Population	418	0.03	0.05	-0.03	0.47
Share (65+)	418	0.07	0.02	0.02	0.39
Share (Male)	418	0.50	0.01	0.46	0.58
Number of Metro stations	418	0.87	1.17	0	6
Distance to the Nearest International School	418	1.04	0.61	-1.48	2.44
OAR Land Price (MM₩/m^2)	418	3.09	1.55	1.29	14.72
Share (Employment-Manufacturing)	418	0.09	0.08	0.00	0.50
Share (Employment-Construction)	418	0.05	0.05	0.00	0.31
Share (Employment-Service)	418	0.85	0.09	0.46	0.99
Share (Employment-Restaurants, Hotels, Wholesale, and Retail)	418	0.30	0.10	0.10	0.84
Shift-Share IV	418	1.43	2.27	0.03	23.87
Net Flow 2015 (/Population 2005)	418	-0.01	0.09	-0.37	1.26

Figure 3: Change in the number of natives and immigrants – 2006-2015





NOTE: THE VALUES SHOWN IN THE MAP ARE STANDARDIZED BY THE SIZE OF THE TOTAL POPULATION IN 2006.

4. Empirical Framework

Using the data specified in section 3, we empirically investigate natives' response to the inflow of immigrants, particularly whether they leave their residential neighborhoods due to the inflow. The basic specification we estimate takes the following form:

$$\frac{\Delta N_i}{L_{i,2006}} = \beta \frac{\Delta I_i}{L_{i,2006}} + \Theta X_i + \gamma_d + \varepsilon_i.$$

The dependent variable ($\Delta N_i / L_{i,2006}$) is the change in native population from 2006 to 2015, standardized by the total population in the initial year (2006). The explanatory variable ($\Delta I_i / L_{i,2006}$) is the change in immigrants, standardized in the same manner as in the dependent variable. The term X_i includes other neighborhood-specific controls such as population density and industrial structure. The term γ_d represents school district fixed effects. Finally, ε_i is a zero mean idiosyncratic random error.

Since the dependent variable and explanatory variable are transformed in the same way, the coefficient β can be interpreted as the change in the number of natives owing to a one person increase in the number of immigrants. For instance, $\beta = -1$ indicates a full displacement effect or "crowding out," while $\beta = 0$ indicates no displacement.

This basic specification closely follows Card (2001) and Card (2007) who estimate the magnitude of native displacement in response to immigration across the local labor market.[12] The only difference in our specification is the unit of

[12] Using microsimulations, Peri and Sparber (2011) concluded that—among many others—this specification performs well and correctly uncovers negative relationships when displacement exists.

analysis. We use cross-neighborhood variations within a single local labor market (Seoul) instead of a cross-city variation.

Although we control for rich characteristics of neighborhood and school district fixed effects, the estimates from simple regressions are likely to be biased due to omitted variables and reverse causality. For example, unobservable neighborhood-level amenities—such as school quality—could be correlated with the inflow of immigrants.[13] Additionally, immigrants may avoid neighborhoods with a specific native demographic. Accordingly, interpreting the estimates as causal requires exogenous shocks in immigration across neighborhoods.

Before turning our attention to these challenges, we first show our results from the simple regressions to indicate the correlation between the change in natives and the change in immigrants. Table 4 describes the ordinary least squares (OLS) results from our regression. Column 1 shows a basic specification that includes a log of the total population and the population density in the initial year (2006). In Columns 2 and 3, we progressively include other neighborhood-level characteristics. Finally, in Column 4, we also add the 11 school-district fixed effects to get rid of unobservable factors that vary across school districts. This means we use the variation within the school district to estimate the crowding-out effect of immigrants.

[13] Native flight due to deteriorated school quality (e.g., Betts and Fairlie, 2003; Cascio and Lewis, 2012) may also occur in Seoul. This study, however, abstracts from the issue by controlling for school district fixed effects. In Seoul, natives' movements based on school quality mostly occur *across* school districts. In pursuit of equal educational opportunities, Seoul has maintained a strict equalization policy since 1974. As a part of the equalization policy, students were randomly assigned to a nearby (high) school within each school district (e.g., Han and Ryu, 2017; Hahn et al., 2018). Most of the endogenous correlation between internal migration and school quality can be removed by controlling for school district fixed effects.

Table 4: Neighborhood choices of natives in response to the inflow of immigrants (OLS regression)

	(1)	(2)	(3)	(4)
$\Delta I_i / L_{i,2006}$	-0.176	-0.162	-0.122	-0.087
	(0.118)	(0.127)	(0.145)	(0.193)
$log(L_{i,2006})$	-0.119***	-0.136***	-0.143***	-0.177***
	(0.043)	(0.046)	(0.048)	(0.059)
Population density	-0.091***	-0.098***	-0.103**	-0.099***
	(0.033)	(0.034)	(0.040)	(0.036)
Share old		-1.664**	-1.686*	-0.764
		(0.774)	(0.965)	(1.118)
Share male		-0.182	-0.763	-0.489
		(0.743)	(0.814)	(0.937)
# of metro stations			0.000	0.001
			(0.010)	(0.010)
Distance to int'l school			0.037**	0.018
			(0.017)	(0.019)
Share manufacturing			0.007	0.082
			(0.103)	(0.112)
Share construction			0.256	0.207
			(0.232)	(0.233)
Share service			0.125	0.134
			(0.239)	(0.237)
Housing price			-0.023	-0.054
			(0.042)	(0.098)
School District FE				X
Observations	418	418	418	418
R-squared	0.089	0.098	0.108	0.125

NOTES: THE DEPENDENT VARIABLE IS THE CHANGE IN THE NATIVE POPULATION BETWEEN 2006 AND 2015 RELATIVE TO THE TOTAL POPULATION IN 2006. THE EXPLANATORY VARIABLE IS THE CHANGE IN IMMIGRANTS BETWEEN 2006 AND 2015, RELATIVE TO TOTAL POPULATION IN 2006. ROBUST STANDARD ERRORS ARE IN PARENTHESIS. ALL REGRESSIONS ARE WEIGHTED BY TOTAL POPULATION IN 2006.

***P< 0.01, **P< 0.05, *P< 0.1

Focusing on the coefficient of interest— β—all the estimates are negative and range between -0.18 and -0.09, although they are not statistically significant. For example, Column 3 shows that an increase in one immigrant is associated with a decrease of approximately 0.12 natives. However, these estimates could be overestimated due to unobservable neighborhood level shocks being likely to affect both natives and immigrants in the same way. For instance, both native and immigrant households may be similarly affected by a new housing development in the neighborhood. To address these issues, we develop an instrumental variable strategy.

4.1 Instrumental variable

As a source of a plausibly exogenous variation in immigrants, we use the introduction of the special visa programs for overseas Koreans as a supply-push factor that is exogenous to neighborhood conditions. Since the introduction of the visa programs, there has been remarkable growth of overseas Korean.

Table 5 documents this significant growth of overseas Koreans using data from the F-4 visa system. From 2008 to 2016, the increase in overseas Koreans was almost 800%, while the increase in overall immigrants was 77%. Among overseas Koreans, the most significant increase was in Korean-Chinese immigrants, which showed a remarkable 11,000% increase. Since most of these overseas Koreans moved to and settled in foreign countries a long time ago, they tend to choose neighborhoods with communities similar to their adopted home country. For example, many Korean-Chinese move into *Daerim-dong*, where a large number of Chinese have resided.

Table 5: The increase in immigrants based on data from the F-4 visa system

		F-4 Visa (Overseas Koreans)			
	Total Immigrants	Total	From China	From the U.S.	From Canada
2008	1,158,866	41,732	2,453	27,513	6,584
2016	2,049,441	372,533	275,342	45,784	15,846
Growth Rate	76.9%	792.7%	11,124.7%	66.4%	140.7%

To exploit the variation from this large and sudden increase of overseas Koreans by ethnicity, we interact the growth of overseas Korean from the F-4 visa with immigrant enclaves across neighborhoods in Seoul:

$$\frac{\widehat{\Delta I_i}}{L_{i,2006}} = \sum_c \left[I_{i,2005} \cdot \delta_c^{\mathrm{G(i)}} \cdot \frac{I_{2006}^c}{I_{2005}^c} \right] \cdot g_c \cdot \frac{1}{L_{i,2006}}.$$

The first part, $\left[I_{i,2005} \cdot \delta_c^{G(i)} \cdot \frac{I_{2006}^c}{I_{2005}^c} \right]$, is the predicted number of immigrants in neighborhood *i* by country of origin *c*, combining the three different terms. Specifically, the term $I_{i,2005}$ is the number of immigrants in neighborhood *i* in 2005. The term $\delta_c^{\mathrm{G(i)}}$ is the fraction of nationality *c* out of total immigrants in Gu *G(i)* in 2005.[14] The last term is simply the growth rate of immigrants by nationality *c* between 2005 and 2006. The second part, g_c, is the growth rate of overseas Koreans between 2008 and 2016 by nationality *c*.[15] Finally, by multiplying these two parts and then standardizing it by the total population in 2006 ($L_{i,2006}$), we predict the change in the number of immigrants due to the national shifts in overseas Koreans, which was caused by the expansion of the F-4 visa.

This identification strategy closely follows Altonji and Card (1991) and Card (2001). While our identification is similar to them in exploiting the variation in existing immigrant communities, we use the exogenous expansion of the F-4 visa as a supply-push factor, rather than the overall growth of immigrants. In this sense, our approach is in line with that of Peri et al. (2015), who also uses large

[14] A "Gu" consists of several neighborhoods and is the second smallest administrative unit in South Korea. A school district in Seoul consists of 2 or 3 Gus.

[15] We use year of 2008 as base year in calculating the growth rate, because the number of overseas Koreans before 2008 was zero.

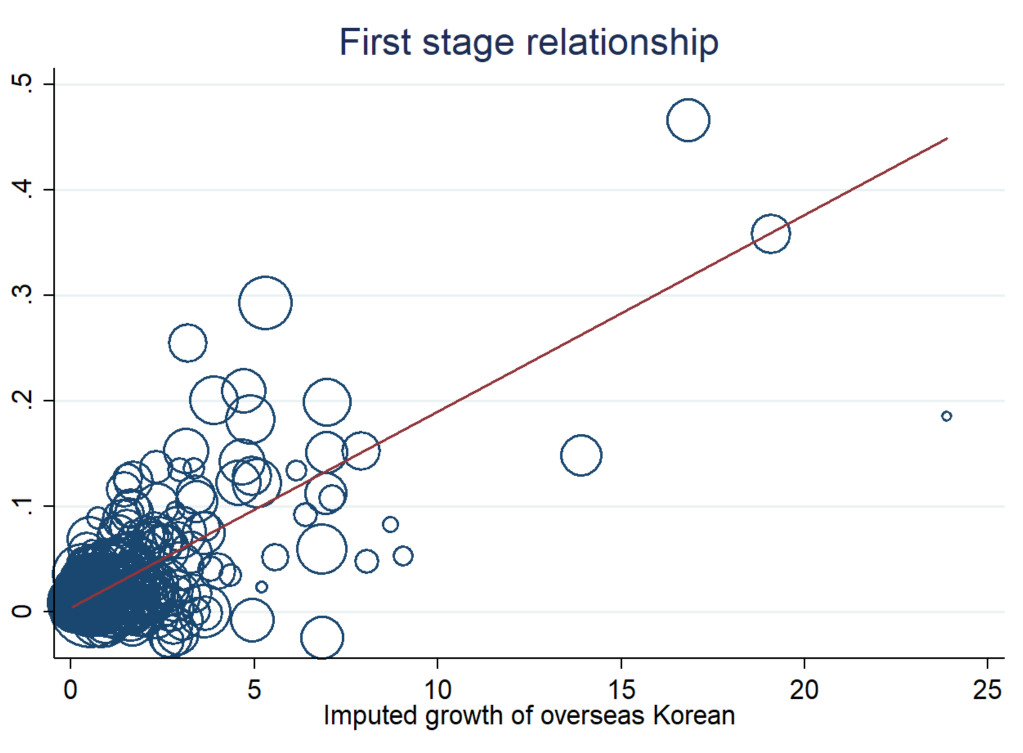
shifts in the national H-1B visa policy in the United States interacted with immigrant communities.

Using this policy-driven shift as a supply-push factor has several advantages, compared to the standard immigration enclave instrument. First, we use a sharp increase in immigrants (overseas Korean) due to the policy change, and thus more likely captures supply shock of immigrants. Second, the expansion of the F-4 visa resulted in substantial changes in the country of origin in immigrants. For example, the fraction of Chinese Koreans has significantly expanded since 2007. This suggests that our instrument is less likely to conflate the short- and long-run responses to the inflow of immigrants (Jaeger et al. 2018).

Formally, for exclusion restriction, our model hinges on an important assumption: the *interaction* between the expansion of the F-4 visa system and immigrant enclaves in 2005 is uncorrelated with other neighborhood-level characteristics that affect natives' residential location choice. In other words, our instrument—after controlling for other characteristics—affected the distribution of natives only through the inflow of immigrants. The predetermined distribution of foreign nationals in 2005 is less likely to be correlated with other local factors because the number of immigrants before 2006 was small and relatively stable while immigration numbers have recently increased significantly (Figure 1).

Before formally describing our first stage regression results, Figure 4 shows the relationship between our imputed instrument and the actual change in immigrants across neighborhoods in Seoul. The size of the circles represents the size of the population in 2005, and the line indicates the linear regression fit. There are several notable points of this figure. First, there are significant variations in the increase of overseas Koreans, due to the expansion of the F-4 visa system (see Table 5). Second and more importantly, the model strongly predicts the actual inflow of immigrants, showing sufficient power in the first stage. This indicates that the expansion of the F-4 visa system has generated sufficient variation in the inflow of overseas Koreans.

Figure 4: First stage scatter plot – an imputed increase of overseas Koreans



Formally, our first stage regressions are as follows:

$$\frac{\Delta I_i}{L_{i,2006}} = \phi \frac{\widehat{\Delta I_i}}{L_{i,2006}} + \Gamma X_i + \sigma_d + u_i.$$

The coefficient ϕ is our main explanatory variable in equation (1), representing the impact of the F-4 visa system driven increase in overseas Koreans compared to the actual increase in immigrants. The positive and statistically significant coefficient indicates that our model predicts actual change in immigrant population well and should provide reasonable estimates in our second stage regressions.

Table 6 shows these first stage results, with each column essentially mirroring the OLS results shown in Table 4. Across all the specifications, the imputed inflow of overseas Koreans into neighborhoods strongly predicts the actual inflow of immigrants. Specifically, a 1-percentage point increase in the predicted inflow of overseas Koreans leads to an increase of 0.02 percentage point in immigrants in general. These estimates are highly significant, even when considering the school-district fixed effects in Column 4. The F-statistics are above 30 and thus free from weak instrument bias, confirming that our model has sufficient power.

Table 6: First stage regressions.

	(1)	(2)	(3)	(4)
$\widehat{\Delta I_i}/L_{i,2006}$	0.019***	0.018***	0.018***	0.016***
	(0.002)	(0.002)	(0.003)	(0.003)
$log(L_{i,2006})$	-0.006	-0.005	-0.005	-0.004
	(0.004)	(0.004)	(0.006)	(0.006)
Population density	0.008***	0.009***	0.007***	0.006**
	(0.002)	(0.002)	(0.003)	(0.003)
Share old		0.062	-0.041	-0.005
		(0.096)	(0.108)	(0.125)
Share male		0.274*	0.247	0.102
		(0.148)	(0.178)	(0.174)
# of metro stations			-0.001	-0.001
			(0.001)	(0.001)
Distance to int'l school			-0.003	-0.002
			(0.002)	(0.003)
Share manufacturing			-0.020	-0.033
			(0.025)	(0.028)
Share construction			0.021	0.011
			(0.027)	(0.028)
Share service			0.039*	0.039*
			(0.023)	(0.023)
Housing price			-0.010**	-0.006
			(0.005)	(0.008)
1st stage F	60.20	52.18	49.32	32.26
School District FE				X
Observations	418	418	418	418
R-squared	0.551	0.555	0.567	0.593

NOTES: THE DEPENDENT VARIABLE IS THE CHANGE IN IMMIGRANTS BETWEEN 2006 AND 2015, RELATIVE TO THE TOTAL POPULATION IN 2006. THE EXPLANATORY VARIABLE IS THE IMPUTED CHANGE IN IMMIGRANTS BETWEEN 2006 AND 2015, RELATIVE TO THE TOTAL POPULATION IN 2006. ROBUST STANDARD ERRORS ARE IN PARENTHESIS. ALL REGRESSIONS ARE WEIGHTED BY THE TOTAL POPULATION IN 2006.

***P< 0.01, **P< 0.05, *P< 0.1

Table 7 provides further suggestive evidence for the validity of our instrument. We ran some falsification tests to examine the possibility of a spurious correlation between our model and the pre-period (2005-2006) net migration of natives. Column 1 shows our main explanatory variable, which is potentially endogenous with the pre-period net migration of natives, and we find a significant negative correlation between them. This implies that immigrants have moved to places where natives have moved out. Columns 2 to 4 shows similar regressions with our instrument (instead of the main explanatory variable). Column 2 shows the pre-trends of all natives, and Columns 2 and 3 tests pre-trends by reasons of migration using the SIM data. If our instrument is valid, these correlations should be reasonably close to zero. The estimates in Columns 2 to 4 are small and statistically not different from zero, suggesting that our instrument is less likely to be correlated with unobservable confounders.

4.2 Natives avoid a greater increase in immigrants

Using the predicted change due to the introduction of the F-4 visa system as an instrument for the actual change in immigrants, we present the two-stage least squares (2SLS) estimates from equation (1) in Table 8. The first four columns of Table 8 mirror the OLS specifications in Table 4. Column 1 includes the log of population and density in the initial year (2006). Column 2 adds more demographic controls, including the percentage of old (aged 65 or higher) and male population. Column 3 is our preferred specification and includes local characteristics such as the number of metro stations and housing price. Finally, Column 4 contains 11 school district fixed effects, which control for fixed but unobservable neighborhood characteristics.

Table 7: Falsification tests on the net migration of natives – 2005 to 2006

	(1) All	(2) All	(3) Reason: Job	(4) Reason: All others
$\Delta I_i/L_{i,2006}$	-0.084***			
	(0.028)			
$\widehat{\Delta I_i}/L_{i,2006}$		-0.002	0.001	-0.003
		(0.001)	(0.002)	(0.002)
$log(L_{i,2006})$	0.001	0.002	0.010	-0.008
	(0.008)	(0.008)	(0.010)	(0.009)
Population density	0.003	0.003	-0.010*	0.013**
	(0.004)	(0.004)	(0.006)	(0.006)
Share old	0.205	0.208	0.166	0.042
	(0.212)	(0.212)	(0.233)	(0.222)
Share male	0.053	0.035	0.408	-0.373
	(0.160)	(0.149)	(0.289)	(0.294)
# of metro stations	0.001	0.001	-0.004	0.005
	(0.003)	(0.003)	(0.003)	(0.004)
Distance to int'l school	0.001	0.001	-0.000	0.002
	(0.006)	(0.006)	(0.006)	(0.006)
Share manufacturing	0.010	0.012	-0.033	0.045
	(0.026)	(0.026)	(0.041)	(0.042)
Share construction	0.024	0.023	0.010	0.013
	(0.056)	(0.056)	(0.081)	(0.090)
Share service	-0.050	-0.053	0.010	-0.063
	(0.052)	(0.052)	(0.046)	(0.042)
Housing price	0.023**	0.024**	0.032**	-0.008
	(0.010)	(0.010)	(0.013)	(0.012)
Observations	418	418	418	418
R-squared	0.025	0.024	0.034	0.031

Notes: The dependent variable is the net migration of natives between 2005 and 2006, relative to the total population in 2005. The explanatory variable is the imputed change in immigrants between 2006 and 2015, relative to the total population in 2006. Robust standard errors are in parenthesis. All regressions are weighted by the total population in 2006.

***p< 0.01, **p< 0.05, *p< 0.1

Table 8: Neighborhood choices of natives in response to the inflow of immigrants (2SLS)

	(1) All	(2) All	(3) All	(4) All	(5) Male	(6) Female
$\Delta I_i/L_{i,2006}$	-0.560***	-0.619***	-0.529**	-0.671**	-0.244**	-0.285**
	(0.188)	(0.232)	(0.239)	(0.280)	(0.114)	(0.128)
$log(L_{i,2006})$	-0.127***	-0.144***	-0.149***	-0.183***	-0.072***	-0.077***
	(0.046)	(0.048)	(0.049)	(0.060)	(0.024)	(0.025)
Population density	-0.087***	-0.093***	-0.099***	-0.095***	-0.048***	-0.051**
	(0.032)	(0.032)	(0.038)	(0.034)	(0.018)	(0.020)
Share old		-1.644**	-1.717*	-0.790	-0.826*	-0.891*
		(0.775)	(0.963)	(1.098)	(0.466)	(0.499)
Share male		0.359	-0.249	-0.085	-0.059	-0.190
		(0.846)	(0.874)	(0.971)	(0.414)	(0.468)
# of metro stations			0.001	0.001	0.000	0.000
			(0.009)	(0.010)	(0.005)	(0.005)
Distance to int'l school			0.032*	0.014	0.016**	0.016*
			(0.016)	(0.019)	(0.008)	(0.009)
Share manufacturing			0.020	0.078	0.021	-0.001
			(0.101)	(0.107)	(0.050)	(0.052)
Share construction			0.276	0.228	0.115	0.160
			(0.228)	(0.224)	(0.110)	(0.119)
Share service			0.157	0.176	0.080	0.077
			(0.245)	(0.242)	(0.118)	(0.127)
Housing price			-0.025	-0.047	-0.010	-0.015
			(0.041)	(0.095)	(0.020)	(0.021)
1st stage F	60.20	52.18	49.32	32.26	49.32	49.32
School District FE				X		
Observations	418	418	418	418	418	418
R-squared	0.085	0.092	0.104	0.118	0.106	0.102

Notes: The dependent variable is the change in the native population between 2006 and 2015 relative to the total population in 2006. The explanatory variable is the change in immigrants between 2006 and 2015, relative to the total population in 2006. Robust standard errors are in parenthesis. All regressions are weighted by the total population in 2006.

***p< 0.01, **p< 0.05, *p< 0.1

The 2SLS estimates in Table 8 range between -0.7 and -0.5 and are statistically significant. This suggests that natives respond significantly to the increase in immigrants by leaving their neighborhoods. Particularly, Column 3 shows that a 100-person increase in immigrants leads to a decrease of approximately 53 natives. The 2SLS estimates are generally more negative than the OLS estimates in Table 4. This confirms that some unobservable neighborhood-level shocks such as large-scale community developments affect natives and immigrants in the same way, resulting in an upward bias of the OLS estimates.

Columns 5 and 6 show our further investigations into the heterogeneous responses of natives by gender. This tests natives' differing attitudes toward immigrants by gender. For example, women may be more reluctant to live in close proximity to immigrants due to security and crime concerns. Our results indicate that the estimates for female natives are larger than those of males in absolute terms. Comparing Columns 5 and 6, a one person increase in immigrants leads to a 0.24 person decrease in native men but to a 0.29 person decrease in native women.

4.3 Reasons of native flight

While the results in Table 8 clearly illustrate that natives avoid neighborhoods with a substantial increase in immigrants, the factors causing these results are not apparent. To investigate the reasons for this crowding out effect, we utilize the SIM data concerning between-neighborhood migrations of natives between 2006 and 2015. Specifically, we decompose the estimates in Table 8 according to the reasons of migrations such as job- or housing-related reasons. Furthermore, we investigate whether the estimated effects differ across different demographic groups of natives.

Table 9 shows migration responses of natives according to reasons of relocations. Column 1 shows the overall change in natives due to the migration, which confirms the results from Table 8. That is, between 2006 and 2015, approximately 0.6 natives have left their neighborhoods due to the inflow of immigrants.[16] Columns 2 to 6 explain the net migration of natives according to their reason for moving such as job, family, or housing. Interestingly, Column 2 shows that the net migration of natives due to their jobs is actually positive, indicating that neighborhoods with a high concentration of immigrants have attracted some natives for job-related reasons. This may suggest that there is a complementarity between natives and immigrants at the neighborhood level (Peri and Sparber, 2009). On the other hand, the native's migration for reasons other than job-related factors is consistent with the main results in Table 8. Specifically, the estimates in Column 3 and 4 are -0.49 and -1.04, respectively, suggesting that the main reasons for natives leaving their neighborhoods are family- or housing-related.[17] Migration due to other reasons—such as education—in Columns 5 and 6 are not significantly affected by the increased presence of immigrants.

Table 9: Internal migration of natives (2SLS)

[16] Since the population changes arising from births and deaths are not counted in the statistics of moving, the estimate in Table 9 (column 1) is not exactly the same with the estimate in Table 8. Nonetheless, this estimate from moving records is sufficiently close to the previous estimate from population statistics.

[17] Examples of these family and housing related migrations from the moving-in reports include marriage or purchase of property.

	(1) All	(2) Reason: Job	(3) Reason: Family	(4) Reason: Housing	(5) Reason: Education	(6) Reason: All others
$\Delta I_i/L_{i,2006}$	-0.606***	0.691*	-0.491***	-1.040**	0.057	0.176
	(0.216)	(0.402)	(0.171)	(0.504)	(0.077)	(0.202)
$log(L_{i,2006})$	-0.062	-0.027	0.004	-0.066	-0.005	0.033
	(0.043)	(0.021)	(0.010)	(0.045)	(0.006)	(0.027)
Population density	-0.110***	-0.037***	0.003	-0.041	-0.005	-0.030**
	(0.037)	(0.012)	(0.007)	(0.037)	(0.004)	(0.013)
Share old	-0.961	-0.547	-0.241	-0.303	-0.032	0.163
	(0.851)	(0.507)	(0.220)	(0.885)	(0.117)	(0.544)
Share male	0.017	-1.074	-0.644	0.668	0.621	0.446
	(0.801)	(0.858)	(0.634)	(1.270)	(0.487)	(0.761)
# of metro stations	-0.001	0.007	-0.003	-0.010	0.001	0.003
	(0.008)	(0.006)	(0.003)	(0.009)	(0.002)	(0.006)
Distance to int'l school	0.032**	0.001	0.001	0.047***	-0.009**	-0.007
	(0.014)	(0.013)	(0.006)	(0.017)	(0.004)	(0.013)
Share manufacturing	0.017	0.082	0.060	-0.015	-0.110***	-0.001
	(0.080)	(0.094)	(0.046)	(0.111)	(0.030)	(0.090)
Share construction	0.080	0.100	-0.035	0.074	-0.085**	0.026
	(0.198)	(0.153)	(0.066)	(0.215)	(0.041)	(0.170)
Share service	0.173	0.002	-0.017	0.237	-0.009	-0.040
	(0.237)	(0.085)	(0.040)	(0.219)	(0.019)	(0.087)
Housing price	-0.000	0.097***	-0.034***	-0.089**	0.016***	0.011
	(0.037)	(0.026)	(0.011)	(0.038)	(0.006)	(0.028)
1st stage F	49.32	49.32	49.32	49.32	49.32	49.32
Observations	418	418	418	418	418	418
R-squared	0.107	0.111	0.122	0.050	0.131	0.021

Notes: The dependent variable is the net migration of natives between 2006 and 2015, relative to the total population in 2006. The explanatory variable is the change in immigrants between 2006 and 2015, relative to the total population in 2006. Robust standard errors are in parenthesis. All regressions are weighted by the total population in 2006.

***p< 0.01, **p< 0.05, *p< 0.1

To further look for heterogeneity across natives, we examine whether natives with different individual characteristics respond differently to increase in immigrants. As the SIM data provides ages and household types of natives, we are able to classify migration of natives based on ages and household types, along with the reasons of migrations.

Table 10 explains how natives with different age groups are affected by increase in immigrants. In Panel A, we first examine job-related migrations, which shows only positive and significant estimate in Table 9. We find that young people (aged 19 to 34) in column 2 are mostly affected by inflow of immigrants. That is, increase in jobs due to immigration is mainly for young workers. Note that we find no effect on the group aged 0 to 18 in column 1. This result may be viewed as a placebo test, because children are less likely to participate in labor market.

Panel B of Table 10 focus on migrations due to the family- and housing-related reasons which shows significantly negative estimates. We denote these two reasons as "non-job-related". For this non-job-related migration of natives, the native flight is relatively homogeneous across different age groups. All age groups significantly out-migrated their neighborhoods in response to increased presence of immigrants, while there are differences in magnitudes.

Table 10: Migration of natives by age groups and reasons (2SLS)

	(1) Age 0-18	(2) Age 19-34	(3) Age 35-54	(4) Age 54+
Panel A: Job-related reasons				
$\Delta I_i / L_{i,2006}$	0.023	0.528*	0.112	0.028
	(0.036)	(0.270)	(0.091)	(0.026)
Panel B: Non-job-related reasons				
$\Delta I_i / L_{i,2006}$	-0.289***	-0.603**	-0.468**	-0.172**
	(0.111)	(0.283)	(0.188)	(0.071)
1st stage F	49.32	49.32	49.32	49.32
Observations	418	418	418	418

NOTES: THE DEPENDENT VARIABLE IS THE NET MIGRATION OF NATIVES BETWEEN 2006 AND 2015, RELATIVE TO THE TOTAL POPULATION IN 2006. THE EXPLANATORY VARIABLE IS THE CHANGE IN IMMIGRANTS BETWEEN 2006 AND 2015, RELATIVE TO THE TOTAL POPULATION IN 2006. ROBUST STANDARD ERRORS ARE IN PARENTHESIS. ALL REGRESSIONS ARE WEIGHTED BY THE TOTAL POPULATION IN 2006.

***P< 0.01, **P< 0.05, *P< 0.1

In Table 11, we also classify natives into 4 different types of households: married families with children, married without children, and single households (men and women). In Panel A, for job-related migration of natives, we find that the in-migrations of natives are mainly for single households (columns 3 and 4). These results are consistent with the results in Table 10 which describes that young natives are more likely to in-migrate to areas with large increase in immigrants for jobs.

In Panel B, we examine whether there are differences in native flight across households. For example, certain types of households—such as families with children or single women—may be more reluctant to live in neighborhoods with large increase in immigrants. Comparing columns 1 and 2, we find that families with children are slightly more negatively respond to immigration than families without a child. In columns 3 and 4, the crowding out effects of immigration is stronger for single men than single women. However, these differences in estimates are relatively small and not significantly different. Thus, we conclude that the native flights due to non-job-related reasons are relatively homogenous for all groups of households.

Table 11: Migration of natives by household types and reasons (2SLS)

	(1) Families with children	(2) Families without a child	(3) Single Women	(4) Single Men
Panel A: Job-related reasons				
$\Delta I_i / L_{i,2006}$	0.013	0.022	0.262**	0.335*
	(0.023)	(0.021)	(0.133)	(0.180)
Panel B: Non-job-related reasons				
$\Delta I_i / L_{i,2006}$	-0.178**	-0.122**	-0.310**	-0.348**
	(0.069)	(0.051)	(0.137)	(0.168)
1st stage F	49.32	49.32	49.32	49.32
Observations	418	418	418	418

Notes: The dependent variable is the net migration of natives between 2006 and 2015, relative to the total population in 2006. The explanatory variable is the change in immigrants between 2006 and 2015, relative to the total population in 2006. Robust standard errors are in parenthesis. All regressions are weighted by the total population in 2006.

***p< 0.01, **p< 0.05, *p< 0.1

A comparison of our results to previous literature regarding natives' responses to immigration will be of value. Saiz and Wachter (2011), for instance, found that natives avoid immigrant areas due to the slower property value appreciation, arguing that this more gradual appreciation is due to the relatively lower socioeconomic status of immigrants, rather than their foreignness per se. Other studies (Betts and Fairlie, 2003; Cascio and Lewis, 2012) focused on the role of native demand for public schools, and their studies showed that natives tend to switch to a private school upon a large inflow of immigrants.

Our results confirm that housing-related migration is one of the main reasons for native flight but also provides other potential reasons. First—as shown in Table 9—natives may leave their neighborhoods due to family-related reasons. Second, we find that the reasons for native flight have little correlation to labor market opportunities. In fact, some natives, in particular for young workers, may even be attracted to neighborhoods with a high concentration of immigrants for job-related reasons. Finally, we also rule out the possibility that racial or language issues play a role in native flight, as the majority of immigrants in South Korea are ethnic Koreans.

5. Robustness checks

Despite various empirical specifications and several exercises including pre-trends tests and heterogeneous responses, our results may still be influenced by unobserved regional characteristics, unobserved outliers, or spurious correlations. To alleviate these concerns, we provide several alternative specifications to test the robustness of the main results.

Our first concern is that an increase in immigration is highly concentrated in certain areas or neighborhoods, as described in Figure 3, which means that our results could be strongly influenced by the results from these specific areas. To test this possibility, in Column 1 of Table 12, we first add 25 Gu fixed effects instead of the 11 school-district fixed effects as tested previously. This means we use within-Gu variation removing Gu-specific pre-trends. Even with this highly demanding specification, the estimates are similar to those in Table 8 and display sufficient first stage power. Similarly, in Column 2, we exclude the two Gus—Geumcheon and Yeongdeungpo—where the largest increase in immigrants took place during the study period to check whether our results may be inordinately affected by these areas. The estimate is slightly more negative, suggesting that the crowding out effect exists in the other neighborhoods as well. In Column 3, we test whether our results are merely a continuation of the pre-trends by directly controlling for the net migration of natives between 2005 and 2006, which we use as an outcome for the falsification test in Table 7. Reassuringly, the estimate changes very little. Finally, Column 4 omits the neighborhoods with the smallest population (bottom 5%) to see if the crowding out effect is highly influenced by smaller neighborhoods. Although the estimated coefficient becomes smaller, the estimate is still strongly significant.

Table 12: Robustness checks (2SLS)

	(1) Control: Gu fixed effects	(2) Excluding Geumcheon & Yeongdeungpo	(3) Control: pre-trend 2005-2006	(4) Excluding places with smallest population
$\Delta I_i / L_{i,2006}$	-0.668**	-0.789*	-0.516**	-0.294*
	(0.281)	(0.461)	(0.240)	(0.165)
$log(L_{i,2006})$	-0.200***	-0.161***	-0.149***	-0.107***
	(0.062)	(0.051)	(0.049)	(0.040)
Population density	-0.089***	-0.098**	-0.099***	-0.065***
	(0.034)	(0.039)	(0.038)	(0.025)
Share old	-0.328	-1.817*	-1.747*	-1.932*
	(1.210)	(0.963)	(0.966)	(1.016)
Share male	0.306	-0.151	-0.258	-1.033
	(0.932)	(0.990)	(0.872)	(0.843)
# of metro stations	-0.000	0.000	0.000	0.004
	(0.010)	(0.010)	(0.009)	(0.008)
Distance to int'l school	0.012	0.035*	0.032*	0.037**
	(0.023)	(0.018)	(0.016)	(0.015)
Share manufacturing	0.150	0.005	0.018	0.038
	(0.111)	(0.118)	(0.101)	(0.094)
Share construction	0.165	0.287	0.272	0.177
	(0.226)	(0.236)	(0.228)	(0.225)
Share service	0.137	0.187	0.164	-0.021
	(0.255)	(0.264)	(0.245)	(0.197)
Housing price	-0.069	-0.030	-0.028	-0.009
	(0.119)	(0.042)	(0.042)	(0.038)
1st stage F	30.22	33.98	47.23	48.02
Gu FE	X			
Observations	418	390	418	397
R-squared	0.137	0.097	0.105	0.091

NOTES: THE DEPENDENT VARIABLE IS THE CHANGE IN THE NATIVE POPULATION BETWEEN 2006 AND 2015, RELATIVE TO THE TOTAL POPULATION IN 2006. THE EXPLANATORY VARIABLE IS THE CHANGE IN IMMIGRANTS BETWEEN 2006 AND 2015, RELATIVE TO THE TOTAL POPULATION IN 2006. ROBUST STANDARD ERRORS ARE IN PARENTHESIS. ALL REGRESSIONS ARE WEIGHTED BY THE TOTAL POPULATION IN 2006.

***P< 0.01, **P< 0.05, *P< 0.1

Overall, the estimates in Table 10 are robust across the different specifications, confirming that natives tend to avoid neighborhoods with an increased number of immigrants.

6. Conclusion

This study examined native Koreans' response to an increased inflow of immigrants by relocating to different neighborhoods. The analysis used an administrative dataset including 418 *hangjungdongs* or neighborhoods within Seoul, South Korea from 2006 to 2015. We extract plausibly exogenous variation from the endogenous location choices of immigrants, by using the expansion of the F-4 visa system and the past settlement of ethnic groups.

Our results reveal that the arrival of 10 more immigrants leads to a decrease of approximately 5 natives from their neighborhoods. This crowding-out effect was slightly more significant for native women than for men. We further investigated why natives tend to leave neighborhoods with an increasing number of immigrants by studying their reasons for moving. We find that in most cases, the native flight is due to the family- or housing-related reasons. On the other hand, our results show that a small number of natives have moved into immigrant communities due to job-related reasons. Our overall results suggest that areas with a high concentration of immigrants are less desirable to natives likely due to the relatively lower socioeconomic status of immigrants.

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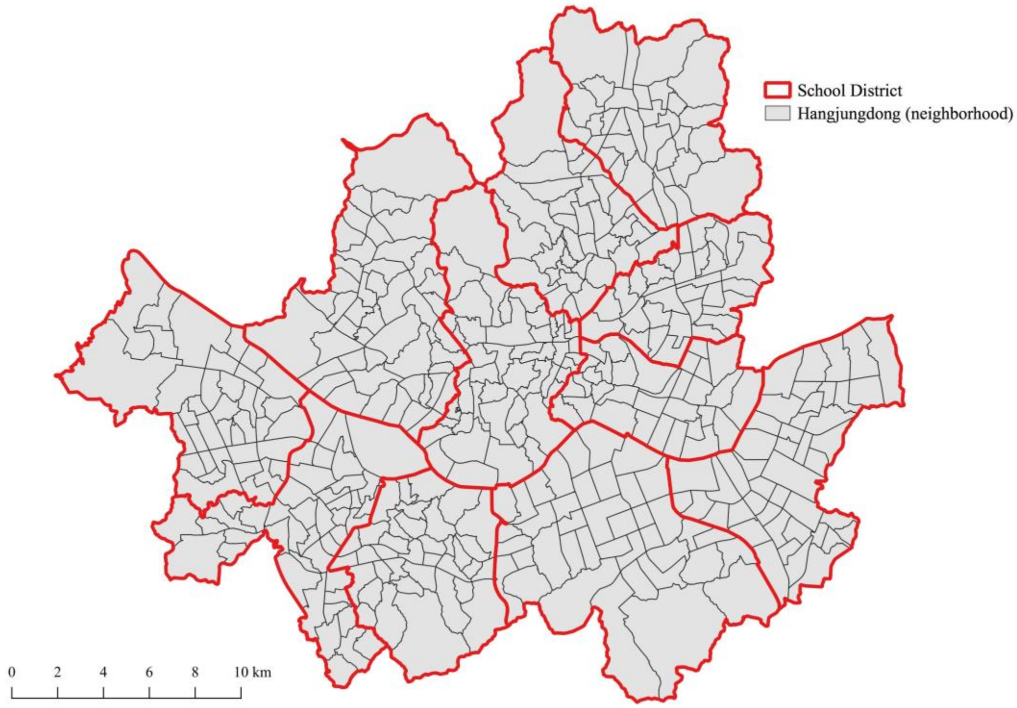
APPENDIX A



FI A-1: SCHOOL DISTRICT MAP