Do Immigrants Crowd Out Natives From Their Residential Neighborhoods?: Evidence from Seoul, Korea

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Abstract

This study investigates the impact of an increase in immigrant inflow on native Koreans' residential choice in narrowly defined neighborhoods within Seoul using a unique administrative dataset. Our study gathers data regarding the 2007 introduction of visas for overseas Koreans (the F-4 visa program) as a source of plausibly exogenous variation in the inflow of immigrants, which confirms that townships in Seoul lost more than five natives for every ten additional immigrants between 2006 and 2015. Additional analyses using a built-in survey question in the internal migration move-in registration form suggest that the crowding out effect of immigration is due to natives' preference, rather than to labor market opportunities.

Keywords: *Immigrants, Native Flight, F-4 Visa program, South Korea*

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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) and may spark conflicts and social tensions. Particularly, the segregation of immigrant communities may cause adverse effects such as a decline in future labor market outcomes regarding immigrants' children or a low degree of assimilation (Cutler et al., 2008; Chetty et al., 2014; Danzer and Yaman, 2013).

This study investigates whether an inflow of immigrants triggers increased segregation between immigrants and natives or the "flight" of the native population in South Korea. There is a substantial body of literature regarding this question, and one study by 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). However, the question of which immigrant characteristics trigger the tendency of native flight remain unanswered. We aim to discover whether it is due to ethnic, cultural, linguistic, religious, or socio-economic differences.

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 increase in Asia, excluding the Middle East (UN, 2017). The case of South Korea is remarkable because a significant share of immigrants consists of overseas Koreans (i.e., ethnic Koreans that reside in other countries, such as Chinese Koreans). This information allows us to investigate whether immigrants sharing the same language and ethnicity will trigger a similar impact on the native population as immigrants of a different ethnicity. For our study, we gather high quality administrative datasets from various sources which are combined at the level of the smallest administrative unit within a city. This enables us to analyze the impact of the increased number of immigrants on natives' residential neighborhoods and within the same local labor market. Furthermore, we introduce a novel administrative dataset on the registered internal migrations of natives and their specific reasons for moving, gathered from a built-in survey question on compulsory move-in registration form. This provides a rare opportunity to look into the reason for natives' response to increased density of immigrants within their neighborhood.

Our identification strategy exploits information regarding the introduction of the visa for overseas Koreans (F-4 visas) in 2007. Using the spatial distribution of each immigrant group in 2005 as weight, we imputed the increase of overseas Koreans—driven by the F-4 visa—into 418 neighborhoods in Seoul, which is a "shift-share" instrument. This instrument accurately reflects the actual increase of immigrants during the study period. Furthermore, this instrument is not correlated with the net migration of natives in the pre-period (2005-2006).

We find that the growing immigrant communities during the period 2006-2015 led to a substantial increase in natives' out-migration. Our investigation reveals that neighborhoods in Seoul on average lost more than five natives for every ten immigrant arrivals, with a slightly stronger effect on female natives.

To examine the potential reasons for this native flight, we use Statistics on Internal Migration (SIM). SIM provides the self-reported reasons for migration that are required by the move-in registration form. Those reasons are broadly categorized into several groups, for example job, family, or housing. Since all natives who relocate across administrative boundaries are required to register their change of address within two weeks, we have a high-quality dataset concerning the reasons for the migration of natives. According to this data, the main reasons for native flight are family and housing. We also found that natives simultaneously move *into* immigrant areas for job-related reasons. Our findings suggest that the crowding out effect of immigration is due to natives' preference, rather than to labor market opportunities. These findings have important implications for existing immigration literature.

Next, 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 generate native flight, we rule out ethnic and linguistic heterogeneity as dominant factors. 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 the population of immigrants grows rapidly with different motivations.

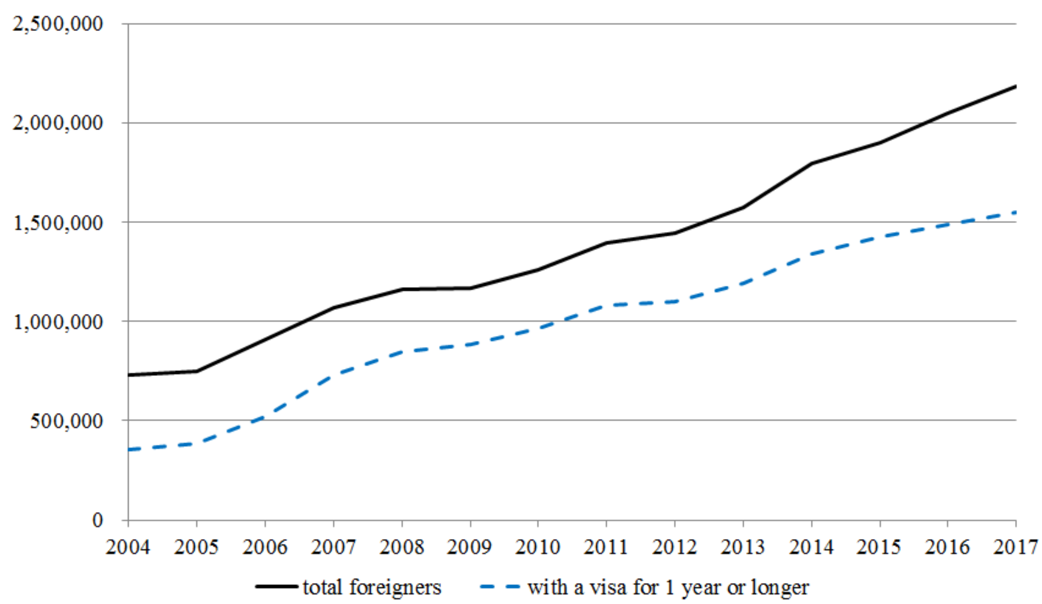
Our results also contribute to the literature pertaining to the effect of immigration by presenting reasons other than labor market opportunities. Although some previous studies analyzed the impact of immigration on other outcomes such as crime and housing prices (Bell et al., 2013; Saiz, 2003, 2007), the existing body of literature mostly focuses on the labor market effects of immigration. Our study confirms that natives often respond to immigration by leaving their neighborhoods and that some native groups—such as females—are more sensitive, which may have significant implications on immigration policy.

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. The results are provided in Section 5, before we review robustness checks in Section 6. In Section 7, we offer our concluding remarks.

2. Background

South Korea has been experiencing a rapid increase in the inflow of immigrants. In 2007, there were more than one million foreigners 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 mentioned stayed 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 are overseas Koreans. Early in the 20th century, many Koreans emigrated to China, Russia, and other countries.[1] 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).

Table 1: Visas pertaining 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). Before 2003, the number of overseas Koreans compared to the total number of immigrant workers in Korea was about 25%. In 2009, they

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

accounted for almost 50% (Lee, 2010). 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 are largely for low- or unskilled jobs in factories, in construction, and services (Park, 2017). In 2016, the largest industries hiring migrant workers were manufacturing and mining (46%), followed by wholesale, retail, accommodation, and the food service industry (19%), and then 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

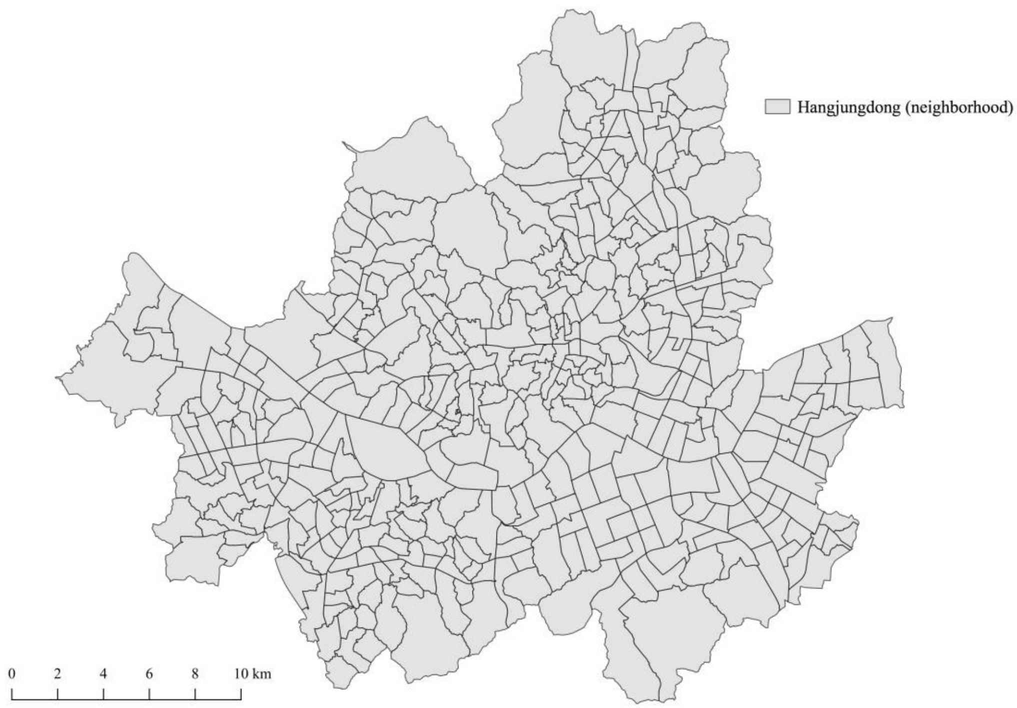
	Age	Total	Education Level			
			No Education	Primary	Secondary	Tertiary+
Immigrants	25+	260,906 (100%)	2,244 (0.9%)	19,783 (7.6%)	154,129 (59.1%)	84,750 (32.5%)
	25-64	244,920 (100%)	636 (0.3%)	15,038 (6.1%)	147,555 (60.2%)	81,691 (33.4%)
Natives	25+	7,169,289 (100%)	124,903 (1.7%)	514,883 (7.2%)	2,626,969 (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

3.1 Data sources

We combine various available sources of administrative data at a *hangjung dong* level. *Hangjung dong* is the smallest administrative unit within a city in Korea. Seoul (605.2 km^2) has 424 *hangjung dong*s, each of which is approximately 1.4 km^2. Our focus throughout the study is regional mobility at this small neighborhood level. The total registered population of Seoul was 10,297,138 in 2015, and among them, 274,957 (2.7%) were foreign nationals.

Figure 2: Map of Seoul showing *hangjung dong* – 2015



The first two sets of administrative data we implement are from the Statistics of Registered Population (2006-2015) and the Status of Registered Foreigners in Seoul (2005-2015). These administrative statistics are used to determine the numbers of registered domestic residents and foreign nationals (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. The SIM data—an individual-level dataset provided by the Statistics Korea—includes the application date [2], the neighborhoods the applicant (and their family) moves into and out of (coded at

[2] The application is required to be submitted within 14 days after moving.

neighborhood level), the main reason for moving, and family background such as the age and gender for each family member. It is significant that a question regarding the main reason for moving exists.[3] This provides a rare look into the reasons behind the internal migration of domestic residents with an exceptionally large sample. Applicants choose from six possible answers: job, education, family, amenities, housing, natural environment, and other. Because it is particularly relevant to our study, we focus on the difference between a specific reason—job—and all the 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, Infrastructure, and Transport.[4] 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 the number of Metro stations, the distance to the nearest international school, and the school district (see 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] This question was added to the official move-in registration form by Statistics Korea, a government agency. The individual is obligated to answer the question truthfully in accordance with the Statistical Law. The individual's confidentiality is protected by the same Act.

[4] 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.

3.2 Sample selection

Our main sample consists of 418 neighborhoods in Seoul. In total, there were 518 neighborhoods in 2006 and 423 neighborhoods in 2015. While the majority of the changes to the number of neighborhoods from 2006 to 2015 were integrations of two or more neighborhoods into one, there were a few divisions and cancellations. We define 418 neighborhoods by the smallest common local areas from 2006 to 2015. We then excluded three outliers where the growth rate of domestic residents between 2006 and 2015 exceeds 1,000%.

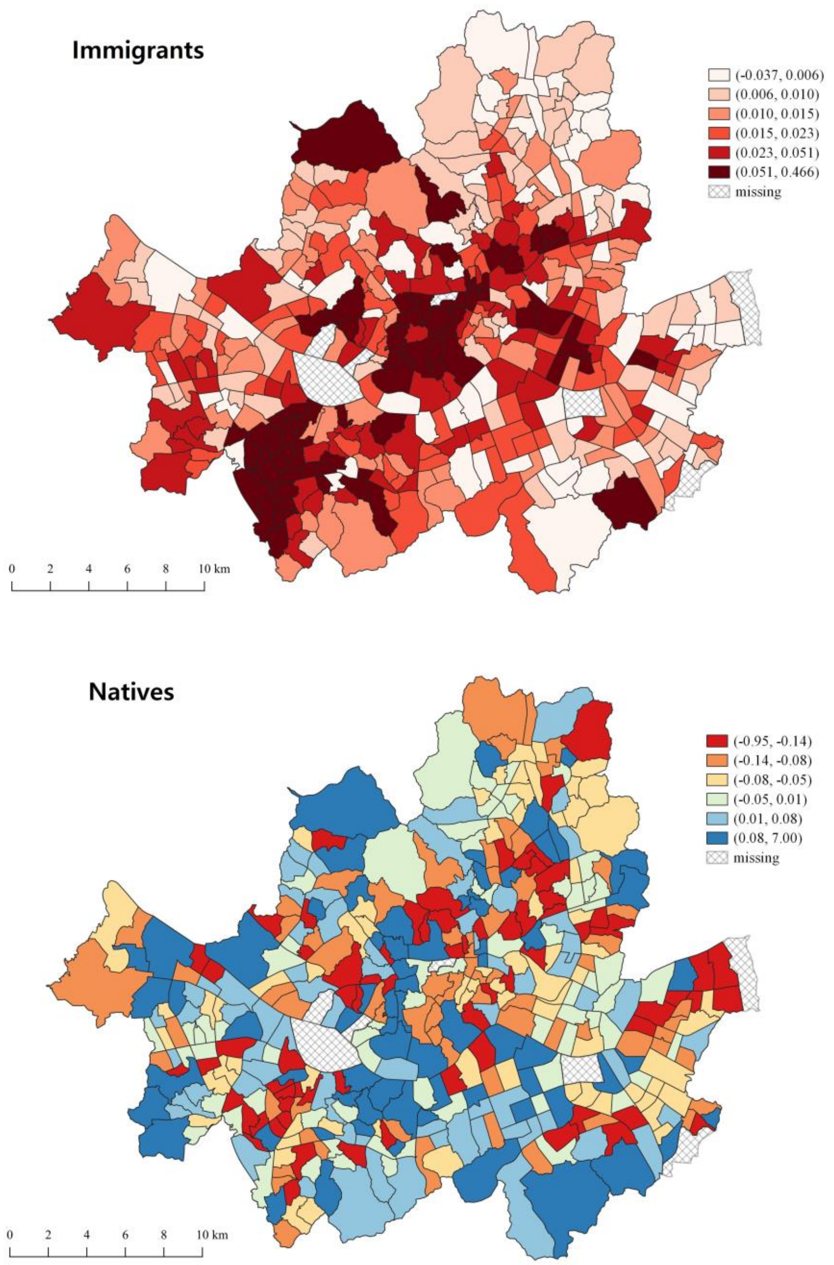
3.3 Descriptive statistics

Table 3 shows a summary of the statistics from the sample. In 2015, the average population per neighborhood was approximately 25,000 with individual neighborhoods' population ranging from 1,000 to 86,000. Between 2006 and 2015, the immigrant inflow accounts for approximately 3% of the total population counted in 2006. However, some neighborhoods showed an increase of more than 10%, with the highest increase 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. At first glance, it is quite clear that the distribution of immigrants is more concentrated relative to the total population, and we occasionally find a decrease in natives in areas with the largest concentration of immigrants. However, it is not immediately obvious 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. Card (2001) and Card (2007) also attempted to estimate the magnitude of native displacement in response to immigration across local labor markets.[5] However, our study uses cross-neighborhood variations within a single local labor market (or our study, both immigrants and natives reside within the same local labor market) instead of a cross-city variation. This means that we are able to study the relocation of natives in response to immigration for reasons other than labor market opportunities, which is the most common reason for relocation and an aspect that has been researched thoroughly in the past. 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.

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

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.

Although we control for the rich dataset of neighborhood characteristics 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[6]—may be correlated with the inflow of immigrants. 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

[6] 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.

means we use the variation within school district to estimate the crowding out effect of immigrants.

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 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 interaction between immigrant enclaves across neighborhoods in Seoul and the introduction of the F-4 visa system as an identification strategy. The F-4 visa provides an overseas Korean with a temporary permit to live and work in Korea, but can be extended for as long as the overseas Koreans wants. Table 5 describes the increase in the inflow of overseas Koreans using data from the F-4 visa system. From 2008 to 2016, the increase in the immigration of overseas Koreans was almost 800%, while the increase of immigrants in general was 77%. Concerning overseas Koreans, the largest 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, since the introduction of the F-4 visa, many of Korean-Chinese have moved into *Daerim-dong*, where a large number of Chinese resides.

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

	Total Immigrants	F-4 Visa (Overseas Koreans) 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 construct an instrumental variable in the following form:

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

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.[7] 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*.[8] 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 introduction of the F-4 visa.

[7] 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.

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

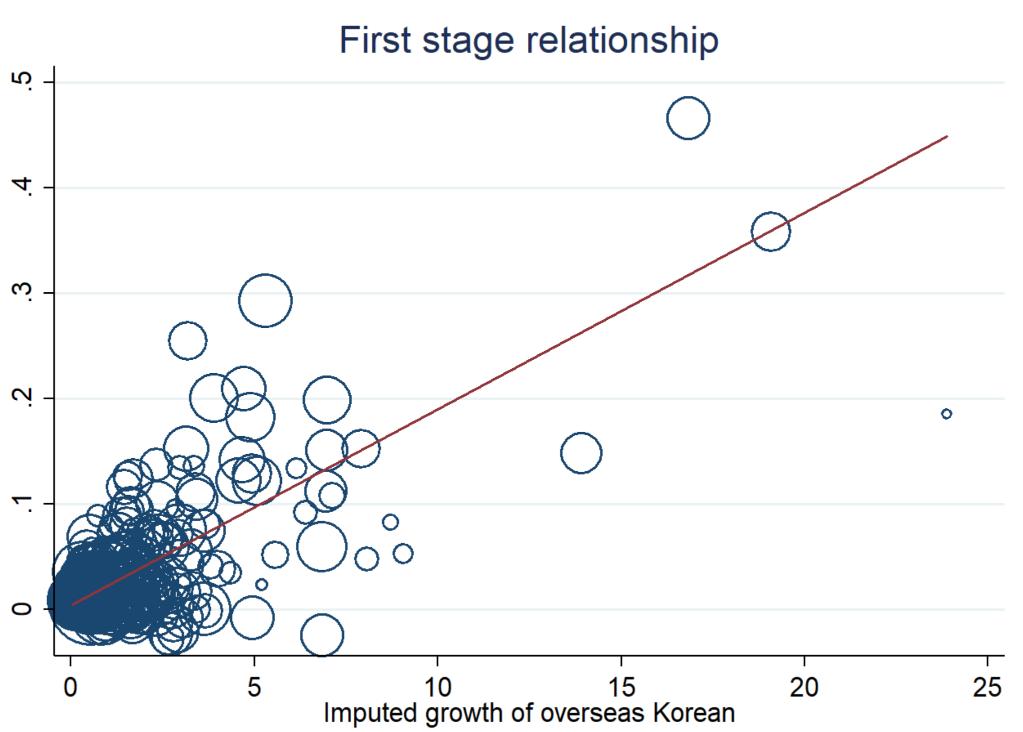
This identification strategy is based on the work of Altonji and Card (1991) and Card (2001). They examined the spatial variation in existing immigrant communities. This study also utilizes data concerning immigrant enclaves based on the national introduction of the F-4 visa, which exogenously increased the inflow of overseas Koreans. The predictive power of our method will be stronger if we can assume that overseas Koreans are more likely to be located within ethnic communities. In this sense, our approach is in line with that of Peri et al. (2015), who also modified Card's (2001) model to study large shifts in the national H-1B visa policy in the United States.

For exclusion restriction, our model hinges on an important assumption: that the past geographic distribution of foreign nationals across neighborhoods in Seoul is uncorrelated with other neighborhood-level characteristics that affect natives' residential location choice. In other words, that ethnic enclaves—after controlling for other characteristics—affected the distribution of natives only by the inflow of immigrants.

The predetermined distribution of foreign nationals in 2005 supports this assumption for two reasons. First, while immigration numbers have recently increased significantly, the number of immigrants before 2006 was small and relatively stable (Figure 1). Therefore, it is less likely to be correlated with other local factors. Second, we exploit the past settlement interacted with the exogenous introduction of the F-4 visa system that is not serially correlated, which generated substantial changes in the country of origin composition. According to Jaeger et al. (2018), these two conditions prevent our instrument conflate the short- and long-run responses to the inflow of immigrants.

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 linear line indicates the linear regression fit. There are several notable points pertaining to this figure. First, there are large variations in the increase of overseas Koreans, due to the implementation 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 introduction of the F-4 visa system has generated sufficient variation in the inflow of overseas Koreans.

Figure 4: First stage scatter plot – 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. Thepositive 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 a find 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 imputed 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 very small and statistically very close to zero, suggesting that our instrument is less likely to be correlated with unobservable confounders.

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

	(1) All	(2) All	(3) Reason: Job	(4) Reason: 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 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

4.2 Natives avoid a greater increase in immigrants

Using the imputed change due 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 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 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 lead to a decrease of approximately 53 natives. The 2SLS estimates are generally more negative than the OLS estimates in Table 4. This confirms that certain 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.

While the results in Table 8 clearly illustrate that natives avoid neighborhoods with a large increase in immigrants, the factors causing these results are not clear. To investigate the reasons for this crowding out effect, we utilize the SIM data concerning between-neighborhood migrations of natives between 2014 and 2015 and the reasons for these migrations.

Table 9 shows the natives' migration responses. Column 1 shows the net overall migration of natives and confirms the results from Table 6. During 2014 and 2015, approximately 0.07 natives have left their neighborhoods due to the inflow of immigrants. However, this is not statistically significant due to the short period. 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 neighborhood level (Peri and Sparber 2009).

On the other hand, native 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 -0.07 and -0.12, respectively, suggesting that the main reasons for natives leaving their neighborhoods are family- or housing-related.[9] Migration due to other reasons—such as education—in Columns 5 and 6 are not affected by the increased presence of immigrants.

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

Table 9: Internal migration of natives (2SLS)

	(1) All	(2) Reason: Job	(3) Reason: Family	(4) Reason: Hosuing	(5) Reason: Education	(6) Reason: Other
$\Delta I_i/L_{i,2006}$	-0.067	0.105*	-0.066**	-0.121**	0.014	0.002
	(0.052)	(0.054)	(0.027)	(0.047)	(0.014)	(0.011)
$log(L_{i,2006})$	-0.008	-0.005***	0.000	-0.002	-0.001	-0.001
	(0.009)	(0.002)	(0.002)	(0.007)	(0.001)	(0.001)
Population density	-0.010	-0.003**	-0.001	-0.006	-0.001	0.000
	(0.008)	(0.001)	(0.001)	(0.007)	(0.001)	(0.001)
Share old	0.149	-0.030	-0.009	0.178	0.011	-0.001
	(0.168)	(0.052)	(0.037)	(0.138)	(0.021)	(0.022)
Share male	0.021	-0.031	-0.089	0.026	0.100	0.014
	(0.195)	(0.111)	(0.085)	(0.182)	(0.073)	(0.037)
# of metro stations	-0.001	0.002***	-0.001**	-0.002	0.000	0.000
	(0.002)	(0.001)	(0.000)	(0.002)	(0.000)	(0.000)
Distance to int'l school	0.003	0.000	0.000	0.004	-0.001*	-0.000
	(0.004)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)
Share manufacturing	0.028	0.016*	0.007	0.027	-0.017***	-0.004
	(0.027)	(0.009)	(0.007)	(0.024)	(0.005)	(0.007)
Share construction	0.075	0.031**	0.006	0.048	-0.015**	0.005
	(0.051)	(0.013)	(0.011)	(0.039)	(0.007)	(0.007)
Share service	0.071*	0.006	0.002	0.062*	-0.001	0.002
	(0.042)	(0.009)	(0.007)	(0.035)	(0.003)	(0.003)
Housing price	-0.014	0.008***	-0.006***	-0.017**	0.003***	-0.002
	(0.009)	(0.003)	(0.002)	(0.007)	(0.001)	(0.001)
1st stage F	49.32	49.32	49.32	49.32	49.32	49.32
Observations	418	418	418	418	418	418
R-squared	0.049	0.139	0.105	0.064	0.116	0.009

NOTES: THE DEPENDENT VARIABLE IS THE NET MIGRATION OF NATIVES BETWEEN 2014 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 slower 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 reason for native flight but also provides other potential reasons. First—as shown in Table 7—natives may leave their neighborhoods due to family-related reasons. This suggests that certain types of families—such as female households—show a more negative response to increased immigration. Second, we find that the reasons for native flight have little correlation to labor market opportunities. In fact, some natives 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, this section describes 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 10, we first add 25 Gu fixed effects instead of the 11 school-district fixed effects as tested previously. This means we use a 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 simply 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 to see if the crowding out effect is highly influenced by smaller neighborhoods. Although the coefficient estimates become slightly smaller in the total, the estimate is still significant.

Table 10: 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 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 *hangjung dongs* or neighborhoods within Seoul, South Korea from 2006 to 2015. Our empirical approach examines the endogenous location choices of immigrants using data derived from the introduction 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 pertaining to native women than to 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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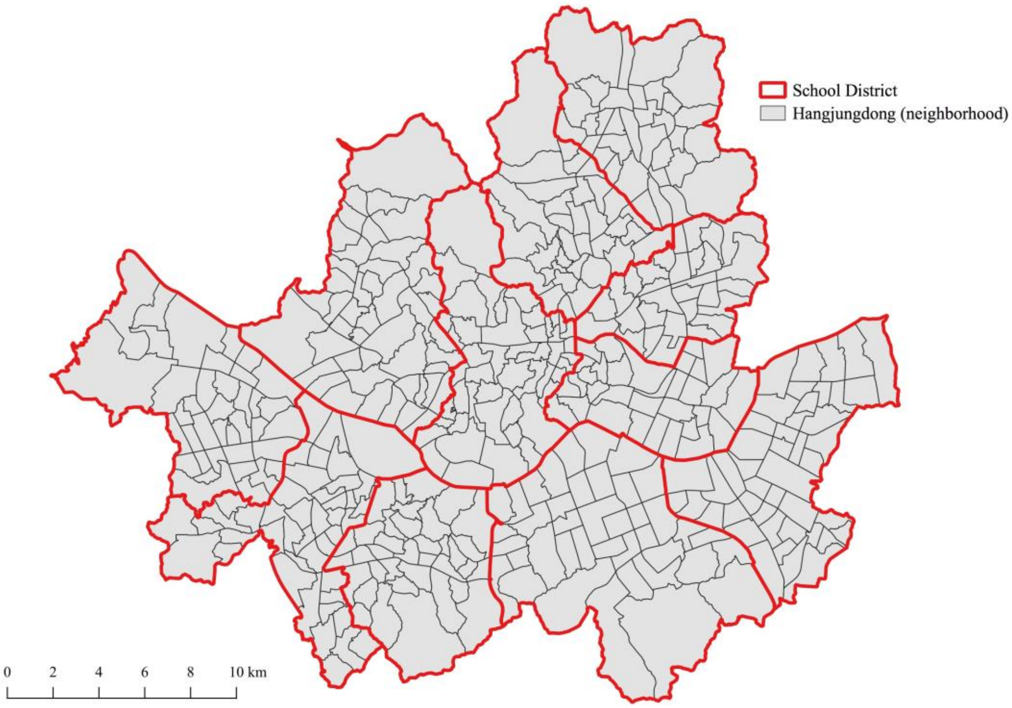
APPENDIX A



FI A-1: SCHOOL DISTRICT MAP